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### "CONTRACTED PELVIS."<sup>1</sup>

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THE paper which I am presenting is a compound of simple, almost crude clinical observation with some academic considerations.

#### Uncertainty.

The genesis of the paper may perhaps help you to follow its presentation. In *The British Medical Journal* of May 23, 1931, was reported a discussion on contracted pelvis at the meeting of the Section of Obstetrics and Gynaecology of the Royal Society of Medicine. From that discussion it seemed that

<sup>1</sup>Read at a meeting of the Victorian Branch of the British Medical Association on May 3, 1933.

even among the highest authorities there was great variation of opinion in respect to: (i) definition, (ii) principles of management.

The vagueness of the definition, which has prompted me to put the title in inverted commas, "Contracted Pelvis", was exemplified by the London Hospital and Queen Charlotte Hospital figures for contracted pelvis:<sup>(1)</sup>

London Hospital, 45 cases in 5,284 deliveries (about 1%);  
Queen Charlotte Hospital, 1,285 cases in 10,646 deliveries  
(about 12%);

and the figures of Whitridge Williams:<sup>(2)</sup>

Johns Hopkins Hospital, 3,100 cases in 11,630 deliveries  
(about 27%).

add to the confusion.

A reference to the discussion will show that ideas of management varied just as greatly, and we find in a standard text book such a philosophical but unsatisfying statement as:

Each case is an original problem. Few things require more experience or a more cultivated judgment than the ability to foretell whether or no the forces of labour will be able to drive a head through with perfect safety to mother and child.<sup>10</sup>

It is unnecessary to elaborate the uncertainty. When high authorities so obviously differed, it seemed reasonable to examine the facts in some simple way in the hope that for those not professing to be experts there might appear some simple classification and some simple principles in management.

Thus prompted, in 1931 I worked on our records at the Women's Hospital, Melbourne. In these records it is customary to group certain vertex cases with more obviously contracted pelvis cases, malpresentations and occipito-posterior presentations being classified separately. This rather loose classification has the advantage of sorting out most of the doubtful and difficult vertex cases.

In the previous three years there had been 10,258 deliveries, of which 199 were classified "contracted pelvis" (about 2%). If we exclude certain miscellaneous cases and patients admitted for repeated Caesarean section, there are 141 cases in which management was by no means easy.

#### Classification.

Certain arbitrary but precise criteria demonstrate among these 141 cases two types:

1. *Positively Contracted Pelvis*: In the positively contracted pelvis the external measurements are not greater than 9:10:7 inches and/or the true conjugate not greater than 3½ inches. The metric equivalent of this definition is approximately 23:25:18 centimetres and 9 centimetres for the true conjugate.<sup>1</sup>

2. *Relatively Contracted Pelvis or Disproportion*: The relatively contracted pelvis or disproportion is exemplified by: (i) a *primipara* with an unfixed head in the last two weeks of pregnancy; (ii) a *multipara* who has lost a well developed child through labour.

In this group the pelvic measurements will often be reduced, but not to the degree already mentioned.

In the residue it is possible to define a type, incompetence, but this has no direct bearing on the present communication.

In the series of 141 "doubtful vertex" cases there are:

Defined cases—	
Positively contracted pelvis .....	21
Disproportion .....	63
Undefined residue .....	57

The justification of this somewhat unscientific classification appears on analysis (Table I).

This table clearly shows that most of the interference and nearly all the bad results occur in the defined group.

A further comparison of the defined types is useful (Tables II and III).

<sup>1</sup> Interspinous diameter, 9 inches (approximately 23 centimetres); intercrural diameter, 10 inches (approximately 25 centimetres); external conjugate, 7 inches (approximately 18 centimetres).

TABLE I. COMPARISON.

Cases.	Number.	Induction.	Caesarean Section.	Still-born.	Deaths.
Defined cases ..	84	28	34	13	2
Residue .....	57	4	1	4	—

<sup>1</sup> This residue is possibly more innocent still, as two of the patients whose infants were still-born were admitted to hospital as "failed forceps", and had they been seen earlier they would probably have been classified as "disproportion".

TABLE II. METHODS.

Type.	Number.	Induction.	Normal	Forceps Delivery.	Caesarean Section.
Positively contracted .....	21	4	3	9	9
Disproportion ..	63	24	18	20	25

TABLE III. RESULTS.

Type.	Number.	Child under 6 Pounds.	Child over 8 Pounds.	Still-born.	Maternal Death.
Positively contracted .....	21	8	1	1	—
Disproportion ..	63	31	31	12	2

An analysis of the 63 disproportion cases shows:

1. Fifty per centum of the babies weighed over 8 pounds (3.6 kilograms).
2. The incidence of Caesarean section was doubled when the baby weighed over 8 pounds.
3. Vaginal delivery resulted in 50% fetal mortality when the baby weighed over 8 pounds.

These tables show that in the two types the methods used have been similar, but that there is a tremendous difference in the child involved, both as regards its size and its safety. From the viewpoint of terminology, the "positively contracted pelvis" with small children justifies nomenclature; the "relatively contracted pelvis" with 50% large children is suitably suggested by the term "disproportion".

A summary at this stage will give us perspective. The doubtful and difficult vertex cases are fortunately not common, about 2% of all deliveries. We can be positive in one group as the result of simple pelvic measurements; we can crystallize our doubt in a second group by a simple clinical definition; and by exclusion recognize a residue in which faith and patience should overcome all doubt and difficulty.

#### Management.

In this ridiculously simple way it has been possible to pick out from our 141 "doubtful vertex" cases 84 which will require positive management, and a residue of 57 in which management is minimal. Further, in the defined cases, while the methods used are similar, the results are so totally different as to the child involved that each type practically nominates its own perspective of management.

*Positively Contracted Pelvis.*—In 21 cases of positively contracted pelvis nine patients required Caesarean section. Induction did not justify itself; all babies born after induction of labour were under

six pounds (2.7 kilograms) in weight, one being still-born and one requiring Cæsarean section. In this group, therefore, accept the high Cæsarean probability. Hope, however, for a small baby, but definitely do not set out to give the mother this small baby by induction. Wait for a natural onset of labour, conduct a careful trial, and do Cæsarean section unless vaginal delivery is obviously easy.

**Relatively Contracted Pelvis or Disproportion.**—Two obvious features about the relatively contracted pelvis or disproportion group are: (i) 50% large children, (ii) excessive still-births.

In this group, therefore, avoid the baby larger than 8 pounds (3.6 kilograms) in weight. "An average child for an average pelvis" would be a good obstetric slogan, and in a general way a fundus 10½ to 11 inches (27 centimetres) from the symphysis means an average child. Induction is very useful in this group and management becomes:

**Primipara.**—Induction if the head is unfixed, provided that the fundus is about 11 inches (27 centimetres) from the symphysis.

**Multipara.**—If a patient has lost a previous baby she is given the option of: (i) induction, (ii) limited trial of labour, (iii) absolutely elective Cæsarean section.

The loss of a large baby suggests induction, of a small baby a limited trial; the elective Cæsarean section is chiefly by request.

In the residue of our Women's Hospital cases interference was minimal and the corollary is obvious; exclude a case from the defined types and the outlook is favourable, no matter how tedious the labour.

#### In Practice.

I feel that I should apologize for this presentation of the obvious, but in the face of the doubt and difficulty expressed by high authorities, some simple dogma is necessary for the peace of mind of the less expert. The suggestions will be found sound in practice, and last year I showed at a clinical meeting at the Women's Hospital some "doubtful vertex" cases managed according to this plan.<sup>(4)</sup>

At this point some practical comment may be made regarding the methods of investigation and management.

#### The Pelvis.

No more elaborate method is used than external pelvimetry and the ordinary digital measurement of the diagonal conjugate when the promontory is palpable. The ordinary pelvis is taken as:

Interspinous diameter . . .	10 inches (25 centimetres)
Intercristal diameter . . .	11 inches (27 centimetres)
External conjugate . . . . .	8 inches (20 centimetres)

designated as 10:11:8 inches or 25:27:20 centimetres. Dropping an inch gives us the positively contracted pelvis already referred to—9:10:7 inches or 23:25:18 centimetres.

Greater exactness is out of proportion to the variable interactions of all the factors in a labour and elaborate internal pelvimetry is certainly uncalled for.

#### The Child.

As in the case of the pelvis, great exactness is not necessary and is less attainable. In a very general way a

10 inch fundus means a 6½ pound baby.
11 inch fundus means a 7½ pound baby.
12 inch fundus means an 8½ pound baby.
13 inch fundus means a very large baby.

In the metric equivalent a

25 centimetre fundus means a 2.9 kilogram baby.
27 centimetre fundus means a 3.4 kilogram baby.
30 centimetre fundus means a 3.8 kilogram baby.
33 centimetre fundus means a very large baby.

This measurement is a direct caliper measurement, and without stressing detail certain minor fallacies may be watched. For example:

1. The lateral measurement of the uterus does not directly influence us, but is useful as a control in the lax abdomen of the *multipara*. It is about 8 inches (20 centimetres) at full term.

2. The markedly pendulous abdomen can be allowed for by an overall tape measurement to the fundus—normally 13 inches (33 centimetres).

3. The fixing of the head will obviously affect the height of the fundus, but any error is in the right direction. Consider, for example, the normal size baby. The fundus may measure barely 10½ inches (26 centimetres) if the head is well fixed, but neither circumstance calls for interference; on the contrary, if the head is "floating", the fundus may measure more than 11 inches (28 centimetres), and if interference is precipitated so much the better.

#### The Relation of Head and Pelvis.

The assessing of the probabilities of a satisfactory outcome by a crude estimation of the pelvis as not too small and the child as not too large may be confirmed by the more scientific method of fitting the head into the brim. This "fine adjustment" should always be tried, but unfortunately in practice the ideal cannot always be attained. There are at least three practical difficulties:

1. The head is undoubtedly the best pelvimeter, but of this aspect of pelvimetry we may truly say with Chenhall:<sup>(5)</sup> "Pelvimetry in obstetric practice is the analogue of percussion and auscultation in clinical medicine, accuracy in both depending on the skill of the operator in interpreting the phenomena."

2. An anæsthetic may be necessary.

3. "The completion of one's diagnosis as to the passage of the head can often be made only when labour has continued some time" (Munro Kerr<sup>(6)</sup>).

In such circumstances staking on general probabilities may be just as successful as ante-natal judgement of the fit of the head in a particular case.

#### Induction of Labour.

Many view induction of labour with disfavour, and this disfavour generally arises from the relative uncertainty as to the outcome. Psychologically this uncertainty is better met by Cæsarean section, but



this will definitely subject certain women to operations—a series of operations in fact—which could be avoided. To those who consider induction a useful obstetric *finesse*, the classification readily separates the cases into those in which induction is unwise, those in which it is useful, and those in which it is unnecessary.

Induction of labour in this communication carries two implications. Firstly, the induction is not for a "premature" or under-developed baby. The time for induction is decided by the size of the foetus as represented by the height of the fundus and not especially by the period of the pregnancy; the 11 inch (27 centimetre) fundus means a baby weighing at least seven pounds (3.2 kilograms). In a positively contracted pelvis induction has no justification, but in disproportion it is a ready method of insuring to a mother a fair try with an average baby. Secondly, induction is merely a method of starting a labour the outcome of which depends on the competence of the mother. In the majority of cases the conditions are favourable and the outcome is a satisfactory vaginal delivery. On the other hand, certain cases may be looked on as "unfavourable" inductions from the beginning, for example, disproportion in a *multipara* whose still-born baby was not oversize; in such a case incompetence had probably been a factor. In such cases, if a limited trial shows that the labour mechanism is not competent to expel the child, Caesarean section is still safe.

In the series mechanical (tube) and medicinal methods were used in about equal numbers.

#### Trial Labour.

Trial labour is not designed to produce the baby; it is merely a means of assessing the probabilities of its ultimate vaginal delivery. Despite the statement of Bourne<sup>(1)</sup> in the discussion already referred to, trial labour is surely not "a confession of failure of judgement" and a *primipara* should always have some trial before a Caesarean section is done. In the *multipara* a limited trial allows many a woman to demonstrate that she is more competent than as a *primipara*. The trial can be elastic; satisfactory progress would call for a full trial, while an unsatisfactory or "incompetent" onset, for example, with early rupture of membranes, poor flexion and poor rotation, would limit the trial in a case already a potential Caesarean section. Trial labour grafted on to induction is not illogical, though the "favourable" inductions nearly always result in a vaginal delivery.

#### Caesarean Section.

Caesarean section in this series was rarely absolutely elective, often followed a trial labour and occasionally followed an induction. The Caesarean incidence is not excessive; in the 10,258 deliveries the total number of Caesarean sections was 80, a primary incidence, after excluding 40 repeated operations, of 4%. The lower segment operation was sometimes used.

#### Conclusion.

In this attempt to crystallize definition and management there is no pretence of originality, and the suggestions carry no clinical refinement. However, there is provided a useful coarse adjustment—a "rule of thumb"—and on this coarse adjustment may be grafted a fine adjustment according to special details in a particular case. The elaboration of any fine adjustment will only cloud perspective.

The classification of types is crude, but definition is precise and of universal application; as a pure "management classification" it does not interfere with more refined academic diagnosis. Management is sharply defined in relation to type, and although in obstetrics, of all branches of medicine, art and almost instinct plays a very real part, there is often sufficient science for 2 and 2 to make 4.

#### Summary.

1. The paper presents an analysis of 199 cases labelled "contracted pelvis" in 10,258 deliveries.
2. The incidence of really troublesome vertex cases is not high, and of frank pelvic contraction very low.
3. Precise criteria enabled definition in nearly two-thirds of the cases, and the real problems of management were confined almost entirely to these defined cases. The types defined are: (i) positively contracted pelvis, (ii) relatively contracted pelvis or disproportion.
4. Precise management is suggested for each of these two types.
5. Induction has no place in the management of positively contracted pelvis, but is very useful in disproportion. Induction is not done to produce a "premature" or under-developed baby, and is considered merely as a method of starting labour.
6. Short references are made to trial labour and Caesarean section.

#### References.

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#### HYPOLYCAEMIC ANGINA, WITH A REPORT OF FIVE CASES.

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PREVIOUSLY, Bostock and the author,<sup>(1)</sup> in classifying the types of hypoglycaemia, have drawn attention to the occurrence of a cardiac type. Subsequent



observations have shown the extreme importance of hypoglycæmia with cardiac symptoms. The aim of this paper is further to stress this finding and to amplify the description of the symptomatology.

The normal heart, in order to function perfectly, requires not only a good blood flow through the coronary vessels, but also an adequate supply of suitable nutritive elements in the blood itself. Of these glucose is of paramount importance in the process of muscle contraction and a diminution in the available supply leads to early fatigue and imperfect function.

Recently glucose has been recommended in the treatment of cardiac failure, as the sluggish circulation renders the normal amount of available glucose insufficient for the needs of the myocardium. For similar reasons Levine<sup>(2)</sup> has also advised administering glucose to patients with coronary thrombosis.

If glucose is so necessary to maintain the normal contractions of the myocardium, a fall in the blood sugar would be expected, among other things, to produce symptoms due to its impoverishment. That this actually occurs has been proved by several observers.

Modern and Turner<sup>(3)</sup> have each reported the case of a patient with cardiac pain due to insulin overdosage. Middleton and Oatway<sup>(4)</sup> have studied the cardio-vascular changes due to insulin overdosage, and Smith<sup>(5)</sup> has discussed the relationship of anginal pain to hypoglycæmia. Bostock and the writer<sup>(1)</sup> have previously reported the case of a patient who had experienced two attacks of anginal pain due to acute spontaneous hypoglycæmia.

#### Symptoms.

The precordial pain and feeling of exhaustion associated with hypoglycæmia are akin to those of cardiac disease, in that they are both produced by effort and relieved by rest. The attack in the former may occur some time after the exertion, whereas the distress in *angina pectoris* occurs during and causes cessation of the effort. Breathlessness on exertion, which is a common symptom in any state of debility and in cardiac decompensation, occurs frequently in hypoglycæmia.

Many persons, during an attack of acute hypoglycæmic shock, complain of palpitation or fluttering over the precordial area, together with a sensation as "if the heart had dropped"; others describe "a sinking feeling" referred to the same area.

The pain in hypoglycæmia may be of a true anginal character and distribution, but more often it is in the nature of a constant ache, referred to the precordial area, frequently extending upwards and laterally along the *pectoralis major* muscle.

When these facts are considered, it can be seen how closely an attack of acute hypoglycæmia can resemble a cardiac catastrophe and how closely the chronic hypoglycæmic state can simulate cardiac decompensation.

Apart from this subjective evidence, objective signs are frequently found in the electrocardiogram, and unless this is borne in mind, grave mistakes can easily be made.

Middleton and Oatway have stated that the most important electrocardiographic change during insulin shock is a decrease in the height of the *T* wave; the *P* wave is sometimes diminished and the amplitude of the *R* wave decreased with increase of the pulse rate. Smith has noted flattening of the *T* wave and depression of *R-T* or *S-T* interval in hypoglycæmia, and has quoted Stepp and Parade, and Weichmann as having reported similar changes.

I have found that a change in any of the waves of the electrocardiogram may be produced by hypoglycæmia or ketosis. The change is seen mainly in a flattening of *P* and *T* waves with, at times, inversion of *P* in Lead III. There also occur a lowering in voltage of the *QRS* complex and a depression of the *S-T* interval. There does not appear to be any change in the length of the *P-R* or *S-T* interval.

During an acute attack the blood pressure rises at first, then falls, and transitory aortic regurgitation has been observed. The rise in pressure is probably due to a compensatory secretion of adrenaline. My own observations during the stage of chronic hypoglycæmia have revealed in most cases a low systolic blood pressure, frequently below 100 millimetres of mercury, provided there has been no concomitant arterial disease.

Pardee<sup>(6)</sup> states that an abnormally small *T* wave is of itself an uncertain indication, but must be considered in relation to *QRS*. If this is also small in all leads, the smallness of *T* may be due to a weak ventricular contraction; but if *QRS* is normal or large, an abnormally small *T* would indicate a diffuse fibrotic change in the muscle. This myocardial condition rarely improves, although the course may not be rapidly progressive. The *P* wave should measure one to two millimetres in height in the lead showing its largest excursion. Its voltage is a rough index of the auricular function, a small *P* meaning a poorly functioning muscle, and a large one a muscle functioning well. The *P* wave of a normal heart is not frankly downwards in any of the three leads, although it may be diphasic. When *P* has no larger excursion than one millimetre in any lead, we have an indication of a poor state of nutrition, a poor functional condition of the muscle. An abnormally small *P* may also result from a diffuse disease of the auricular muscle. Small *P* waves are seen after prolonged infectious diseases and in hearts which are considered to have narrowing of the coronary arteries. In both instances the factor of poorly nourished muscle is present.

The height of the *QRS* group is greater when the physiological state of the muscle is better, and smaller when it is not so good. A varying state of nutrition of the heart muscle will lead to variations of the maximum excursion of *QRS*. If the waves are very small (under six to seven millimetres) or very large (over sixteen to eighteen millimetres), we can feel safe in saying that the condition of the

heart muscle in the first instance is poor, while its condition in the second instance is good.

Changes in voltage of either one or all of the waves are found in most cases of hypoglycæmia. There seems no doubt that these changes are due to an under-nourished cardiac musculature, not, however, from disease of the coronary arteries, but due to lack of glucose in the circulating blood, which prevents a perfect contraction of the muscle fibres.

The far-reaching effects of constant under-nourishment of the muscle cannot be over-emphasized, and the ultimate production of definite myocardial fibrosis is not an unreasonable assumption. Smith has produced strong evidence to prove that deficient production of lactic acid due to insufficient glycogen is the cause of the flattened *T* waves, but the actual factor of under-nourishment cannot be entirely overlooked.

#### Illustrative Cases.

The following illustrative cases show anginal symptoms suggestive of cardiac disease. The electrocardiogram shows the characteristic changes discussed above.

**CASE I.**—The patient, a trained nurse, aged thirty-five years, complained of the following symptoms:

After two hours' work in the operating theatre a pain developed in the lower precordial area, gradually extending up over the left side of the chest and medially towards the sternum. This was in the nature of a severe ache. At the same time black spots appeared before the eyes and she felt extremely weak and dizzy, being forced to cease work and rest. Any exertion caused fatigue very quickly. Walking any distance brought on shortness of breath, precordial pain and palpitation. This was accompanied by an emptiness in the precordial area and a feeling as if the heart were beating in a vacuum—a sensation difficult to describe. These attacks necessitated stopping work and resting for a while, after which there was a very slow return to normal.

Holidays and sick leave, together with various tonics, over a period of eighteen months brought no improvement, till finally the patient had to resign her position.

On examination the blood pressure and cardiac measurements were found to be normal, and nothing abnormal was detected in a general examination. The fasting blood sugar was 0.075%. An electrocardiogram taken on November 2, 1932, showed definite changes in Lead I, whereas the other leads were normal (see Figure I). In Lead I there was an almost iso-electric *P*, and a *T* wave of less than one millimetre.



FIGURE I.

Case I. Tracings taken on November 2, 1932, and May 27, 1933. Note low voltage *T* waves, Lead I only.

Treatment consisted of four eight-gramme (two-drachm) doses of glucose a day for the first month then eight grammes (two drachms) night and morning.

After six months the patient reported for survey on May 27, 1933. The electrocardiogram showed very definite improvement in Lead I, the *P* wave was present to a height of one millimetre and the *T* wave had increased to 2.5 millimetres (see Figure I). The *R* wave was only

five millimetres in height—slightly less than previously. Even after six months the heart muscle is not functioning perfectly.

The patient stated that the addition of glucose to the diet had caused the disappearance of all symptoms, with a return of the ability to work without fatigue. She has tried on several occasions to cease taking glucose, but after being well for three days the old symptoms would invariably reappear, to be relieved only by taking more glucose.



FIGURE II.

Case II. Tracings taken on April 11, 1933, and June 15, 1933. Low voltage *T* waves and depressed *S-T* interval.

**CASE II.**—The patient, a male, aged forty-seven years, complained of pain in the precordial area of six months' duration. The pains were of a shooting type and occurred at any time.

Four months previous to examination there had been a severe attack while the patient was walking slowly, following a strenuous morning's work. There was an acute pain in the region of the nipple, extending upwards towards the left shoulder. The symptoms disappeared when the patient rested, but returned when he got up, and continued over a period of thirty-six hours. The pain was accompanied by a feeling of emptiness in the lower part of the chest, as if the heart had dropped. One month later a similar attack occurred after three hours' strenuous work with a tractor.

Occasionally, walking up steps produced the pain with shortness of breath. For the past ten years the patient has not been well, being unable to do much work without fatigue, whereas previously he had been very energetic. On one occasion, after surfing before breakfast, he felt extremely weak and then collapsed. He had also suffered from a migrainous type of headache, which was relieved after the removal of some septic teeth.

The heart was normal in size, both clinically and radiologically. The sounds were regular, with no murmurs. The systolic blood pressure was 140 millimetres of mercury and the diastolic 98. An electrocardiogram taken on April 11, 1933, showed in Lead I a *P* wave of 0.5 millimetre and a *T* wave of 1.0 millimetre, with a normal *QRS* complex. In Lead II the *P* and *QRS* waves were normal, with a *T* wave of 1.5 millimetres. In Lead III, *P* and *QRS* waves were normal, with a slight depression of the *S-T* interval and a tendency to a diphasic *T* (see Figure II). These changes were reported by a physician as being suggestive of the late effects of a small coronary thrombosis.

A glucose tolerance test revealed the following figures:

Fasting .....	0.077%
Half hour .....	0.143%
One hour .....	0.130%
One and a half hours ...	0.080%
Two hours .....	0.074%

After one month on glucose treatment on similar lines to Case I, the *P* wave in Lead I had increased to one

millimetre, and the *T* wave to almost two millimetres, whereas the *R* wave had increased from eight millimetres to fourteen millimetres in height (see Figure III). The *S-T* interval in Lead III had returned to normal. The *P* waves were of low voltage, and the *T* waves were frankly inverted, a finding in 30% of normals.

Concomitant with these changes the patient's condition had improved considerably, although he was still not completely well. One attack had occurred the morning

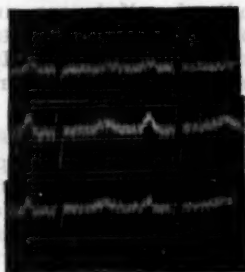


FIGURE III.  
Case III. Tracings taken on  
February 16, 1933. Flattened  
*T* waves.

following a strenuous day's shooting. On the other hand, he had attended a sports meeting and dance without ill effects. In his own words, it was the first time in ten years he had worn his dress suit.

As has been pointed out, return of the electrocardiogram to normal takes a considerable time, but this patient showed definite changes within a month.

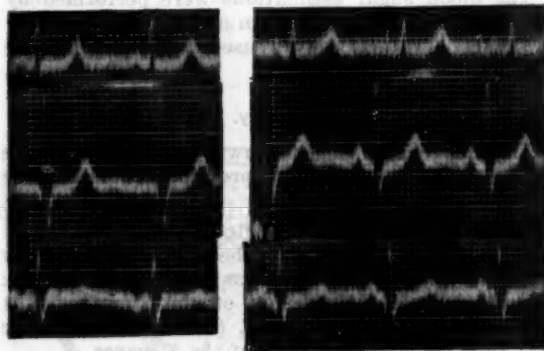


FIGURE IV.

Case IV. Tracings taken on May 2, 1933, and June 17, 1933. Flattened and inverted *P* waves returning to normal.

CASE III.—The patient, a female, aged sixty-four years, gave the following history:

For two years she had suffered from smothering attacks, with pain over the heart radiating into the neck. She frequently became very collapsed and had difficulty in getting her breath. The attacks mostly came on late at night or after heavy work during the day, and would last for an hour or more. They were of frequent occurrence, sometimes more than one on the same day. There was also shortness of breath, and exertion produced precordial and lower substernal pain, which was eased with rest, but did not disappear. Any work at all brought on faintness and dizziness, which was relieved by rest. Nine years previously she had fainted after exertion and was unconscious for five minutes. For many years a severe headache was frequently present on waking in the morning, becoming less severe after breakfast.

An examination of the cardio-vascular system revealed the following findings:

The systolic blood pressure was 110, the diastolic 80 millimetres of mercury. The palpable vessels were normal. There was no increase in cardiac dullness, and the orthodiagram showed normal measurements. The sounds were of poor tone, with a soft localized systolic murmur at the apex and slight accentuation of the second sound at the base.

The fasting blood sugar was 0.074%. Examination of the other systems, blood and urine revealed no abnormality. An electrocardiogram showed small *P* waves and iso-electric *T* waves in Lead I and flattened *T* waves in Lead II. Glucose medication was instituted and within two weeks the attacks ceased and symptoms have not recurred during the six months which have since elapsed.

Unfortunately this patient lives at a great distance in the country, and a follow-up electrocardiogram has not yet been obtained. However, the symptomatology, blood sugar, electrocardiogram, and response to treatment leave no doubt as to the correctness of the diagnosis.

CASE IV.—The patient, a female, aged sixty-five years, complained of a pain below the left nipple, at times aching and at others like a vice gripping her round the chest; the pain had been present for two years. The pain usually came on after meals or after exertion, sometimes forcing her to lie down. When she walked up stairs the severity of the pain often forced her to rest for a short time. There was marked dyspnoea on exertion.

She also complained of giddy turns, in which everything went black, and she had to hold on to something or else she would have fallen. These attacks occurred especially in the early mornings or after exertion. At times during the late evening terribly empty feelings were noticed, and she often awakened during the night with terrifying sinking feelings, temporarily relieved by a drink of water. All these symptoms were much worse in the hot weather, practically disappearing in the winter.

On examination the urine was clear and the hæmoglobin value 90%; the systolic blood pressure was 170 and the diastolic 95 millimetres of mercury, with a median pressure of 110 millimetres of mercury. There was no increase in cardiac dullness. On auscultation an occasional extrasystole was heard and a soft systolic murmur at the apex. A test meal revealed a slight hyperchlorhydria with a rather rapidly emptying stomach. The fasting blood sugar was 0.065%. An electrocardiogram on May 2, 1933, showed normal *QRS* and *T* waves, but definite changes in the *P* wave. *P* was less than one millimetre in Lead I, iso-electric in Lead II, and inverted in Lead III. Glucose medication was instituted with marked improvement in the patient's condition. The dizzy turns disappeared within a few days, but the dyspnoea and pain were still present in a very mild degree six weeks later.

A second electrocardiogram taken on May 17, 1933, showed no change. A third record on June 17, 1933, showed definite improvement. There was no change in Lead I, but in Leads II and III the *P* waves had returned to normal and the *T* wave in Lead III had increased in amplitude.

#### Ketosis.

Attention<sup>(1)</sup> has previously been drawn to the fact that a very close relationship exists between the manifestations of ketosis and those of hypoglycæmia, and the term relative hypoglycæmia has been applied to these cases. The following case further demonstrates this fact, in that there are similar electrocardiographic changes in the two conditions.

CASE V.—The patient, a female, aged twenty-one years, complained of not feeling well for two years, during which time she had been unable to work. Her condition suggested a grave hysteria. The symptoms included almost continual general malaise with headaches and giddiness; scalding feelings on micturition were very marked. She



complained of pain in the region of the eyeball and the lower part of the abdomen. In addition to the above was described a horrible pain over the heart, together with a heaviness and tender left breast, made worse by climbing steps; often this passed as a dull aching pain into the left arm.

The urine on several occasions contained acetone (++++) (Rotheras's test). The glucose tolerance test gave normal results with a fasting sugar of 0.085%. On examination nothing abnormal was detected in the cardiovascular or digestive systems. The electrocardiogram showed a low voltage of *QRS* and a *T* wave of one millimetre in Lead I. In Lead II the *S-T* interval was depressed and the *T* wave less than one millimetre. In Lead III the *S-T* interval was depressed, with an iso-electric *T* wave.

An antiketogenic diet with glucose was given. A second electrocardiogram, taken on June 7, 1933, showed that the *T* wave in Leads I and II and the *S-T* interval in Lead II had returned to normal. The *T* wave had appeared in Lead III to a height of one millimetre. There still remained *P* waves of low voltage in Lead II, iso-electric *P* waves and flattened *T* waves in Lead III.

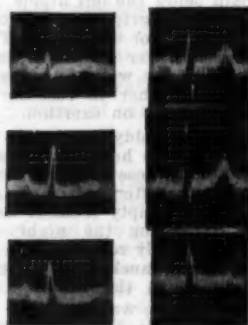


FIGURE V.

Case V. Tracings taken on February 18, 1933, and June 7, 1933. Flattened *T* waves and depressed *S-T* interval. Note return to normal.

The patient is emphatic in stating that there has been a noticeable change in the duration and the severity of the heart pain. This is now mild and does not radiate into the arm. There can be no doubt that amidst the galaxy of symptoms of which this patient complained, attacks of an anginal nature were important, and their amelioration has gone far to pave the way for treatment on psychological lines.

#### Discussion.

It has been said that a blood sugar reading of 0.080% does not constitute sufficient evidence to warrant a diagnosis of hypoglycæmia. On the other hand, undoubted symptoms of a hypoglycæmia can occur when the blood sugar is much higher. In my experience a blood sugar reading of 0.080% should be always looked upon with suspicion. The diagnosis is verified by the clinical history and the therapeutic test which follows the administration of glucose.

The person with acetonæmia lacks the power of utilizing the glucose obtained from an average diet and needs the addition of glucose as well as a reduc-

tion of the fat intake in spite of a normal blood sugar.

It would appear that the changes in the electrocardiographic record must now be regarded as giving important diagnostic criteria in hypoglycæmia and acetonæmia, and afford a valuable indication of the results of treatment. The importance of this finding is self-obvious, since failure to recognize the condition and to institute appropriate treatment has, as happened in Case II, left the way open for the diagnosis of coronary thrombosis with its grave prognostic significance.

In conclusion, I would add that this contribution merely deals with patients with hypoglycæmia who suffer from severe attacks of an anginal nature. Electrocardiographic records of other cases of hypoglycæmia show a tendency for similar changes to occur. That their symptoms are rather those of dyspnoea than of pain must be regarded either as an indication of a less serious myocardial involvement or of an increased sensitivity of the pain-registering mechanism.

Changes in the heart muscle are only one of the many manifestations of hypoglycæmia and ketosis. A great deal of evidence has been collected to show that these conditions are of extreme importance in the production of sinusitis and non-tuberculous pulmonary fibrosis. It is hoped that this will be the basis of a further publication in the near future.

The blood sugar estimations were performed by the micromethod of Hagedorn and Jensen, and fifty grammes of glucose were used for the tolerance tests.

#### Summary.

1. Attention has been drawn to the importance of hypoglycæmia in the production of cardiac symptoms.
2. The electrocardiographic changes in hypoglycæmia and ketosis have been described. They consist of any combinations of the following: (a) flattening or inversion of the *P* waves, (b) low voltage *QRS* complexes, (c) depression of the *S-T* interval, (d) flattening of the *T* waves.
3. Four cases of hypoglycæmia and one of ketosis have been described.
4. There is no doubt that a hot humid climate is of extreme importance in the production of symptoms.

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# OCULAR TORTICOLLIS: INFERIOR OBLIQUE TENOTOMY AND ITS INDICATIONS.

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For many years I have been vaguely aware of a syndrome associated with overaction of the inferior oblique muscle of the eye. But it is only during the last two that I have given the subject the attention that it deserves. Duane, of New York, published an article about it in the *Archives of Ophthalmology* in 1916. But as nothing, so far as I am aware, has appeared in British literature on the matter, I feel that some further reference based on personal experience will not be out of place.

## Anatomical.

It may not be amiss to remind the reader that, when looking straight ahead, elevation of the eyes is effected by the action of the superior rectus muscles. When, however, the eyes are directed sideways (to the left, for example) elevation is accomplished by the coordinated action of the left superior rectus and the right inferior oblique muscles. Which is another way of saying that for purposes of elevation, when the eyes are directed to the left, the right inferior oblique and the left superior rectus are complementary muscles.

The reason for this will be obvious on looking at the diagrams (Figures I and II). When either eye

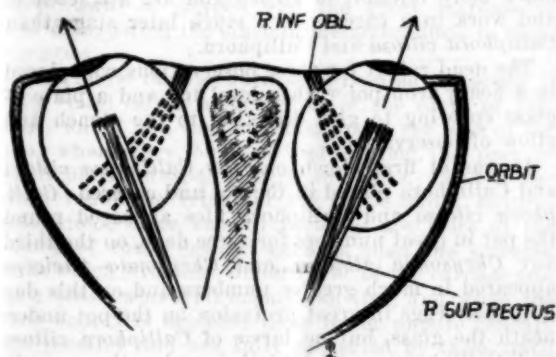


FIGURE I.  
The primary position.

is directed outwards its long axis lies virtually parallel to the line of action of the rectus muscles. Elevation (or depression) as it affects this (outward turned) eye will find the rectus muscle in a position of mechanical advantage.

When, however, the right eye, for example, is turned inwards to the left, its rectus muscle forms in relation to the long axis of the eyeball a very obtuse angle. The superior rectus is now at a mechanical disadvantage as an elevator. Indeed, such action can only be minimal. The task of

elevation of the right eye, when turned to the left, is now relegated to the right inferior oblique, which, it will be noted, now lies with its line of action parallel to the long axis of the (right) eye.

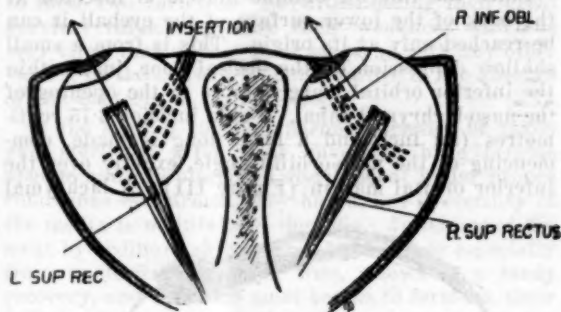


FIGURE II.  
Eyes looking to the left.

## The Alternatives: Ocular Torticollis or Squint.

It would appear that weak action (paresis) of a superior rectus is not very uncommon. Whether it is due to a congenital defect or to a birth injury I do not know. I suspect the latter. The mechanism of the coordinated movement referred to above is a delicate one, and, when it is deranged, what I conceive happens is this. For the movement of the eyes upward and, say, to the left a certain amount of nerve energy is available. That moiety which would normally act on the left (weak) superior rectus cannot now act with the usual effect and so overflows to the other component, the complementary right inferior oblique, causing overaction. This hypertrophies, the initial diplopia becomes accentuated and the overgrown muscle habitually overacts, resulting in the pronounced upshoot of the eye characteristic of the condition when looking laterally upwards.

To avoid inconvenience from the diplopia the child subconsciously seeks relief in one of two ways. If his refraction (hypermetropia and especially anisometropia) favours it, he develops a convergent squint and suppresses the offending image. This, I believe, is the commonest happening. I have found a considerable number of my case notes, both private and hospital, in which, in addition to the description of the squint, I have noted that on looking up and to one side the opposite eye "shoots up". I was not, at the time, fully alive to the importance and significance of the observation and merely recorded it.

The other way in which the discomfort of diplopia is subconsciously avoided is by tilting the head to one shoulder, the so-called ocular or pseudo-torticollis. This expedient will occur, as I imagine, when the refraction is normal and when there is no tendency to lack of fusion and, therefore, to the ready suppression of one image. The appearance is quite typical. The boy (I have met with it only in boys, which lends force to the suggestion of birth injury, since boys have bigger heads than girls) carries the head on one side, somewhat like

a bird. And it is this peculiarity that attracts the notice of the parents.

#### The Remedy.

Since the inferior oblique muscle is inserted at the back of the lower surface of the eyeball it can be reached only at its origin. This is from a small shallow depression on the orbital floor, just within the inferior orbital margin, close to the opening of the naso-lachrymal canal. A skin incision 3.75 centimetres (an inch and a half) long is made, commencing at the naso-orbital angle, exactly over the inferior orbital margin (Figure III). A lachrymal

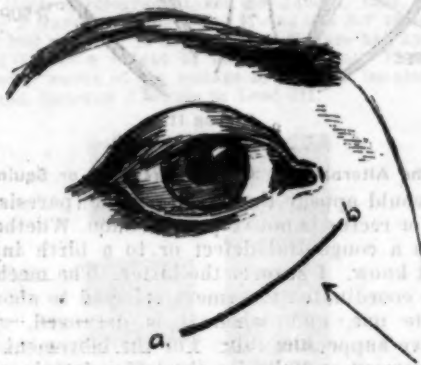


FIGURE III.

a-b = line of incision.

speculum (Müller's) is now inserted and the incision is deepened through fascia and muscle on to the periosteum of the orbital rim, which is felt for with the gloved finger. This is defined in its whole length as far as the naso-orbital angle. Any bleeding points are clamped with forceps and the deep fascia is lightly incised just within the orbital margin. Some orbital fat may appear, but it may be ignored. A squint-hook is now passed just within the orbit towards the naso-orbital angle and the muscle will be withdrawn upon it and will resemble a flat grey earthworm. It is muscular throughout and is also hypertrophied. A piece six millimetres (a quarter of an inch) long is excised and the wound is closed with two or three deep sutures. On two occasions I have encountered some difficulty in defining the muscle, but usually no trouble is met with if the deep fascia is carefully incised. The appearance of the muscle on the hook is quite spectacular owing to its unexpected bulk.

The result in the head tilting cases is very satisfactory. The head becomes straight and diplopia is not complained of. I have performed this operation, apart from three head tilters, on many patients with old squints which had been rectified by operation, but in which this factor of an upshooting eye remained. In future, in such cases, I propose to tenotomise the oblique muscle first and see what effect this will have on the convergence, which was probably first induced by this delinquent factor, but this, of course, will depend on the duration of the squint.

#### THE BLOW FLY PROBLEM.<sup>1</sup>

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THE blow fly problem resolves itself into three parts, each of which more or less affects the issue: (i) The fly, (ii) the sheep, (iii) the pastures.

#### The Fly.

The blow flies are of five main varieties: 1. *Calliphora villosa*; 2. *Calliphora*; 3. *Lucilia serricata*, English fly; 4. *Chrysomia albiceps*; 5. *Chrysomia flaviceps*.

If putrescible material, such as a dead rabbit, is exposed in suitable season, the flies that first appear are *Calliphora villosa* and *Calliphora*. They both feed from and blow the meat, and in summer are viviparous. *Chrysomia albiceps* and *Chrysomia flaviceps* appear in smaller numbers at this fresh stage of the meat, but only feed and depart.

After *Calliphora villosa* and *Calliphora* have worked for some time and when the carcass is offensive definitely, *Chrysomia albiceps* and *Chrysomia flaviceps* appear in greater numbers and work very actively, and are oviparous, the eggs hatching under favourable conditions in six hours. These eggs are at first transparent as to shell and later become opaque from a change in the chitinous envelope. *Calliphora villosa* and *Calliphora* leave the carcass at a much earlier stage than *Chrysomia albiceps* and *Chrysomia flaviceps* and are much less tolerant of the products of putrefaction due to the activity of the larvæ.

*Chrysomia albiceps* and *Chrysomia flaviceps* are much more tolerant of stench and are attracted to and work in a carcass to a much later stage than *Calliphora villosa* and *Calliphora*.

The dead rabbit for these observations was placed in a heavy iron pot with a level top and a plate of glass covering to give direction to the stench and allow of observation.

It was at first blown only by *Calliphora villosa* and *Calliphora* placed in the pot and covered. *Calliphora villosa* and *Calliphora* flies appeared round the pot in great numbers for three days, on the third day *Chrysomia albiceps* and *Chrysomia flaviceps* appeared in much greater numbers and on this day laid their eggs in great profusion on the pot underneath the glass, but no larvæ of *Calliphora villosa* and *Calliphora* were deposited under these conditions, and these latter flies now disappeared. If *Calliphora villosa* or *Calliphora* were caught and placed in the pot now, they transiently crawled on the carcass which was moving with their own larvæ, but did not blow again, and were anxious to escape, and if they could not, they died quickly from the fumes and want of oxygen. When the lid was

<sup>1</sup> This paper was written in December, 1921, on information collected in South Australia in the years 1918-1921, and was submitted to the appropriate authority in Sydney, New South Wales, in 1922. It is the source of the reference on page 27 of Report Number 1 of the joint Blowfly Committee appointed by the Commonwealth Council for Scientific and Industrial Research and the New South Wales Department of Agriculture to investigate the sheep blow fly problem in Australia, issued January, 1932, and antedates the summary of Professor T. H. Johnston and his work in Queensland on this problem in 1923, mentioned in this report on page 27.



removed *Chrysomia albiceps* and *Chrysomia flaviceps* swarmed the carcass and worked very actively, laying eggs by the thousand. If the lid was left off some few of *Calliphora villosa* and *Calliphora* entered but did not work, when the lid was replaced these rapidly became uncomfortable, and it was not for hours later that *Chrysomia albiceps* and *Chrysomia flaviceps* showed any discomfort or ceased operation. Ultimately, however, these desisted, and if they could not escape they rapidly died.

If the lid was left off they still worked actively and continued about until the eighth day in warm weather.

The larvæ in the pot were roughly divisible into: 1. Smooth varieties, large and small, which on hatching produced *Calliphora villosa* and *Calliphora* and *Lucilia serricata*. 2. The serrated varieties large and small which on hatching produced *Chrysomia albiceps* and *Chrysomia flaviceps*.

On the eighth day with the lid on the pot all the smooth varieties crowded up to the top and tried to escape; if they fell into the pot they hurriedly crawled up the sides again if possible, but soon it was seen that *Chrysomia albiceps* and *Chrysomia flaviceps* were devouring *Calliphora villosa*, *Calliphora* and *Lucilia serricata*. About six of the serrated sorts hooked on to one smooth variety and soon sucked it dry, leaving only the empty flat shell, and this went on to the extinction of all the smooth varieties that did not escape. Migration was not so urgent nor so early, it was noticed, if the lid was left off the pot, nor were the predaceous so voracious, so that probably the migration was due to two factors: (i) the danger of destruction, (ii) the withdrawal of oxygen and the great increase in waste hastening the stage of metamorphosis in these varieties.

The larvæ that escaped soon became quiescent, if they could escape under cover of the earth or rubbish; but if not, they crowded under the base of the pot, where they pupated and became the prey of particularly wasps, spiders and ants. And if the dead rabbit be lying on the earth under natural conditions, these smooth varieties are more at the mercy of these natural enemies than the serrated ones which live more under cover of the carcass and in a sense where no enemy can live, and when the food supply is depleted these latter pupate beneath the remains and are fully protected by these until metamorphosis occurs. Thus they are a surviving type.

It is found, however, that a certain proportion of the serrated varieties are found in the more exposed margins of the carcass, and these are the weaker types or the unfit from one reason or another and as they are not equal to the hurly-burly of life, are thus exposed to the risks of enemies from the position they are forced to adopt. And peculiarly the main reason for this unfitness is the fact of their living closer to the stench than was suitable for their metabolism, the result being a weakened system requiring more oxygen to survive, a species of invalidism.

Thus the survivals are particularly fit types and these serrated varieties are found to be the cause of most of the damage to sheep; and where they are established the problem of the fly is confined entirely to these two varieties. Notwithstanding their great survival value they have their weakness which is very vital, that is, that their larvæ as with any other variety of the larvæ are unable to live in the absence of the bacteria of putrefaction.

If the eggs of these oviparous varieties be taken and sterilized after their envelopes have become opaque and are placed on sterile meat under proper conditions of warmth, they hatch, but if sterility of the media is maintained, they die. Infection of the meat by ordinary skin or dust bacteria, or especially from unsterilized eggs or flies, allows of a tardy recovery, and when the meat begins to ferment, their full development; but if recovery is retarded too much the result is a very small stunted, comparatively inactive type, and conversely the destruction of a carcass by bacteria is much more complete and active and occurs in a much shorter time if maggots are present.

Drying is fatal to both maggots and bacteria which require a "sloppy" condition for most rapid development.

The stench of a maggot-infested carcass is much more deadly to flies, and less attractive than the fumes from bacterially decomposed animal remains; in fact, these latter act in various degrees as aphrodisiacs to both male and particularly female flies, and there is always a particular phase of decomposition during which the various flies strike most freely.

For the ordinary flies, *Calliphora villosa*, *Calliphora* and *Lucilia serricata*, the cadaveric odour due to the reaction of skin bacteria on the coarse cleavages of the dead protoplasmic molecule is the most favourable, whilst for *Chrysomia albiceps* and *Chrysomia flaviceps* the late and finer cleavages are necessary, but without the bacterial reaction no fly will blow anything living. Infection of dead meat is assured even in the absence of infection in the particular carcass by the germ carried by the flies in enormous profusion and deposited whilst feasting.

#### The Sheep.

The merino sheep is an alpine animal with small frame and blue mutton, but with a specially modified covering of hair called wool.

The main difference between the merino and other sheep is in the imbrication of the fibre and the development of grease, the latter as apart from the yolk. The grease gives to wool, even in its prepared form, its essential qualities; if all this grease is removed the cloth formed loses its valuable qualities as wool. The woolly fibres are set on the skin in tufts with comparatively large bare areas between (as compared with hairy animals). In these areas the sweat glands discharge. The yolk, which consists partly of grease, sebaceous matter and about 24% of water, is elaborated with the grease by special glands; and these draw on the *panniculus*

*adiposus* layer for the elaboration of their products which are discharged into the hair follicles.

The grease is both in and on the fibre and the yolk is miscible with water; the yolk rises to the surface of the fleece, carrying with it any excess of moisture from the sweat glands. The moisture is evaporated on the surface, the yolk and grease combining with foreign particles on the surface to form tip, and the whole system serves to equalize the temperature of the animal.

If the temperature is excessive from external or internal conditions, the excess is equalized by overaction of the sweat glands in particular. If the action is excessive, it causes a damaging moisture beyond that which can be fixed by the yolk, damaging because a decomposition of yolk occurs with a setting free of crude fatty acids. These fatty acids ultimately cause an irritation of the skin, giving an excessive cellular *débris* which, in the dry state is always present in the fleece to a minor degree as scurf. However, in combination with the cellular *débris* of the sweat glands and in the presence of excessive moisture, the cellular *débris* from the irritated skin forms a suitable pabulum for certain putrefaction bacteria always present on the skin. Although these bacteria are ordinarily inert or multiply to a minor degree in the absence of moisture, under these conditions of moisture unbalanced by the yolk and in certain situations on the sheep, especially if aided by external moisture, they give rise to a putrefactive odour. The odour acts as an aphrodisiac to the female blow flies and these strike the affected area.

Even if the area is not struck by flies, the above conditions result ultimately in the decomposition of the grease of the fibre by bacterial action, and the fibre is then quickly disposed of by moisture and bacteria, a break in the wool occurs, the fleece falls until internal and external conditions of temperature are balanced, a necessary factor in the survival of the animal. The bacterial process, of course, is used in tanning to loosen the fleece. By a natural selection the survival value of a particular variety of sheep is relative to fixed climatic conditions. If the climatic conditions are varied, there is a resulting reversion to the type of sheep normal to those climatic and pastoral conditions. Further, as the temperature of a sheep is a fixed condition in health, there must be an optimum climate in which the seasonal conditions of cold result in an increase in length and density of fleece. If the climate be not at an optimum, the conditions must react on the animal to shorten the fibre or increase the sweat with the above result.

In Nature a careful gradation of carcass to fleece is seen, the finer and denser the wool the shorter the fleece and the smaller the carcass, as in the merino type, no sweat, little yolk, much grease. On the other hand, the larger the carcass and the more mutton produced, the coarser and more open the wool, the thinner the yolk, the more profuse the sweat and the less the grease. In other words, if the heat is well retained by the fleece, the less heat

must be produced inside and the less sweat and yolk are needed to equalize the temperature. When mutton is required, a good furnace is necessary in the digestion. More heat is produced internally; consequently more sweat and yolk are required to equalize the temperature, and less grease is produced to retain the heat. Here the grease glands and the sweat glands form an allelomorphic pair. In the mutton type the sweat gland is the dominant and the grease glands the recessive, whilst the reverse is the case in the merino wool type.

If these types are crossed, as in Australia, to produce the dual purpose type, there will be according to Mendel's numerical proportion a certain number of fine dense wool crosses in which the sweat gland and moisture in the yolk are dominant. These are the type in which putrefaction will readily take place and which will be blown even under favourable pastoral and climatic conditions. If the climatic conditions are unfavourable, the condition of the sheep will be correspondingly worse, and the fly will surely indicate the type.

Even a favourably circumstanced dual type will be at a marked disadvantage the nearer to the tropics it is placed, and before they breed true there will always be a gradually diminishing number of unfavourable types appearing which will be blown even under the most favourable climatic conditions.

The sheep of the tropics are hairy and have only sweat glands, but large carcasses seem immaterial under these conditions.

The effect of carcass is very evident when the wool is changed to the merino type and conditions approach the tropical.

Under these conditions it is very difficult to prevent deterioration of both wool and carcass, as in the South African Merino. The fly nuisance is therefore an expression under warm humid conditions of the beginning change from a woolly to a hairy type.

#### The Pastures.

The temperature of the sheep is maintained by the fuel supplied from the feeding grounds and climate, and pastures which are quickly fattening supply this temperature most easily and in excess. The excess must be equalized by the above mechanism. The merino will live and grow good wool where the mutton sheep will starve, and much can be done in classifying the country along simple lines to lessen the incidence of flies in the dual type. Unfortunately, the nearer the tropics, the greater the humidity, the more luxuriant and fattening will be the pastures, and there is a line of advance to the tropics where the profitable raising of the dual type will be impossible. Short of this line which must be recognized, the type can be grown and the pastures can be managed to overcome the special difficulties which diminish in more temperate conditions. Beyond this line only the mutton type can be grown, the wool becoming of less and less value the warmer the climate, until at last even this type will revert to the hairy sheep of the tropics. So and more rapidly will the transformation occur in the

merino, whilst crossbreeds of the above unfavourable type will be derelicts. The transition stage will always be associated with the blow fly trouble, and the blow fly will be a sure indicator of the unfavourable type for the locality.

#### Summary.

In the sheep growing area in Australia the number of harmful flies may be reduced to two.

Although others may operate, their incidence is harmless in the presence of these two as their larvae are compelled to migrate early or be eaten.

These two noxious flies are named *Chrysomia flaviceps* and *Chrysomia albiceps*, the latter being the worse. No flies are able to operate in the absence of the bacteria of putrefaction.

The flora of the two harmful types are much more virulent and liable to cause septicæmia. These two flies are a dominant type and are able to survive natural conditions which destroy other varieties: their larvae are the so-called hairy forms of maggot.

The bacteria of putrefaction are present on all sheep's skins, and are used by tanners to loosen the fleece.

These bacteria cannot operate harmfully except in the presence of excessive moisture. If moisture is in excess, there is an overaction of all the glands of the skin of the sheep. This excess may be produced under wrong conditions by the sweat glands of the sheep, and is made worse by external moisture.

Normally the excess is taken up by the yolk and evaporated on the surface of the fleece. Over-saturation of yolk leads to its decomposition, setting free fatty acids of rancid odour. Excessive epithelial exfoliation is produced which exceeds the normal scurf; this in the excess of moisture is decomposed by the bacteria. The odour of the decomposition attracts flies, which strike the area affected. The smooth maggot varieties strike earlier, and rapidly produce conditions attracting the dominant damaging types. The conditions producing excessive moisture within the fleece are constitutional and climatic. The climatic conditions are those that favour excessive atmospheric humidity. The constitutional conditions are found in the mutton sheep, as compared with the wool or Merino sheep.

The excess of calories produced by the mutton varieties is equalized by more yolk and sweat glands and less and thinner grease associated with a more open fleece, or shorter fibre. The Merino sheep, if pure, will never give trouble unless in unfavourable climate as above. A cross of the two will give rise to a certain proportion of sheep having a Merino type of fleece and sweat and yolk glands in excess. These are the type that will be struck by flies under any climatic conditions, and are most liable to violent fluctuations of temperature and sickness. These types will be surely indicated by the fly. Unfavourable climatic conditions to wool rather favour rich pastures and the mutton varieties of

sheep and fluctuating calories. A fly-blown sheep is an indication of incipient reversion from woolly to hairy type. Sheep on suitable pastures always have a formed motion. An unformed motion should never occur in a heavy woolled type and can be controlled by pasture as above.

#### To Eradicate the Blow Fly Nuisance.

Do not attempt to eradicate the fly. This in any case is impossible under conditions produced by the rabbit in Australia, and the fly is valuable in the rapid disposal of this large supply of putrescible material and other. Kill out the putrefaction bacteria, or render them inert by breeding the sheep right or maintaining them under right pastoral and climatic conditions. Make the fly the indicator and cull out all that are blown, also cull out any ram that throws a proportion of blown sheep. This is necessarily a gradual process and will take years. Treat the blown sheep and sheep in unfavourable country by chemicals as follows.

The drug that has been found by experiment to be most damaging to the bacterial flora of flies and maggots stands out alone as mercury, and flies as well as maggots have a marked antipathy to it. A solution of a mercury salt not only poisons bacteria, but coagulates their protoplasm, forming an insoluble albuminate of mercury. This albuminate, being situated on the dirty fibre, clings to the wool and forms a bar to later bacterial multiplication. An astringent effect is also produced in the eroded area of skin of sheep and an insoluble film of albuminate of mercury is formed here; thus the surface is sterilized. This insoluble film is gradually acted on by the blood serum, and with sodium chloride in the serum forms a soluble albuminate which circulates in the blood, exerting valuable alterative properties on the sheep and improving its health. It is ultimately thrown out from all secreting glands very gradually and continuously as an insoluble mercury salt which, owing to the large secreting surface formed by the skin of the sheep, absorbs the largest proportion, and thus prevents by its presence the multiplication of the skin bacteria; the fly also is repelled, as well as not being attracted.

Although extremely poisonous, mercury is strictly in this respect on a par with arsenic which is most freely used by pastoralists. Although arsenic is deadly to macroscopic parasites, it has not the deadly effect on bacteria that mercury has.

By utilizing "*Optunia Inermis*" as a vehicle, a colloidal solution of an efficient, less poisonous bactericide than mercury, in association with any known deficiencies of soil and pasture, and including invaluable wool foods, can be used as a dip. Thus one pest will be utilized to help balance economically another pest. Moreover the chain of physiological conservation of energy and profit, which the pest to the uninitiated seems to shatter, will be conserved and the pest will have its true economic value. Even a pest must have economic value or it could not exist.



## CHRONIC PARONYCHIA DUE TO MONILIA.

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D.T.M. and H. (Cantab.).

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DURING recent years attention has been focused upon the rôle of yeast-like fungi in chronic infections in man. A great number of dermatoses have been attributed to yeast-like organisms, including dermatitis following continuous baths, eruptions in nursing infants, intertrigo, *erosio interdigitalis*, onychomycosis, chronic paronychia, dermatitis and paronychia of fruit canners, *perlèche* and superficial glossitis.<sup>(1)(2)</sup> By the courtesy of Dr. Wettenhall and Dr. Kelly, during the last eight months, monilia have been isolated in pure culture from fourteen patients with chronic paronychia attending the out-patient dermatological clinics at the Melbourne Hospital. These cultures have been examined morphologically and biochemically and their pathogenicity for rabbits has been tested. An antiserum has been prepared in the rabbit and tests for agglutination, precipitation and complement deviation have been carried out for the whole series with a view to identification and classification.

#### Clinical Appearance in Paronychia due to Monilia.

With one exception (one occurring in a male laboratory worker), all the examples of paronychia due to monilia observed here have occurred in women.

The infection causes pad or lobster like swellings of the nail wall which, on being squeezed, sometimes emit a bead of pus on the nail plate, the result of minute abscesses on the under surface of the nail wall. The condition is painful and singularly intractable. The nails themselves may be infected by monilia (three cases in the series), the fungus spreading from the nail wall to the nail bed. The appearance of the infected nails is similar to ringworm. In both ringworm and onychia due to monilia, the nail plate becomes opaque and discoloured, irregularly ridged and brittle, and may be raised from the nail bed by greyish white keratotic masses.<sup>(3)</sup>

#### Method of Isolation and Culture.

The technique used for isolation was as follows. In three cases in which the nail was partially destroyed, mycelium was found on microscopic examination of flakes of the nail soaked overnight in

10% potash. Flakes of infected nail were embedded in Sabouraud's medium and incubated at 24° C. When the nail wall only was affected, the point of a Pasteur pipette containing a little sterile saline solution was pushed gently into the pocket (which is always present) at the base of the infected nail or nails. The saline solution was sucked back and forth, washing out the infected contents of the pocket, and was then placed on a "slope" of 1% glucose agar and incubated at 37° C. for twenty-four hours. The culture tubes were then left at room temperature and examined daily for the characteristic oval spores. Mixed growth is the rule, but monilia may be identified in a stained film. They are seen as oval Gram-positive bodies and may vary in size from 3 $\mu$  to 12 $\mu$  (Figure I). They may show budding, and the necklace appearance (*monile*—a necklace) from which the name is derived, may be seen in films from pure cultures.

#### Method of Isolation in Pure Culture.

To obtain pure cultures of the fungus has been the most difficult part of the work on the present series. The method of dilution has been of service in a number of strains. A loopful of mixed growth containing monilia is inoculated into five cubic centimetres of broth and thoroughly shaken. A loopful of this dilution is then spread on 1% glucose agar plates and left at room temperature and examined for isolated colonies at intervals. As the

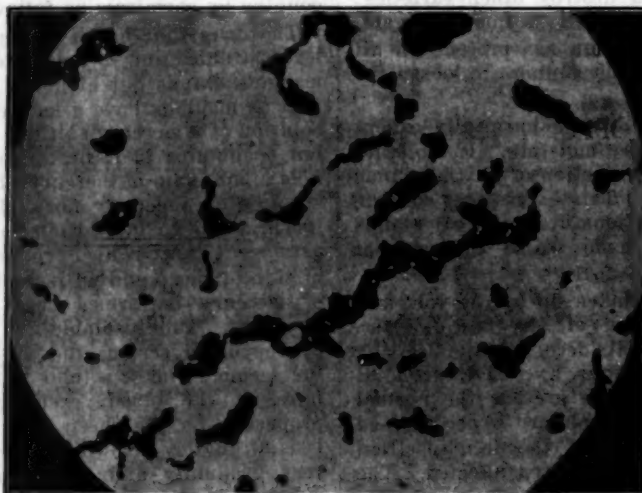


FIGURE I.  
*Monilia albicans* in stained film from paronychia.

contaminating bacteria, staphylococci, *Bacillus proteus*, *Bacillus crissus* et cetera, grow more quickly than the fungus; they tend to obscure the latter. The mixed growth may be diluted with saline solution and injected into the ear vein of a rabbit. In the case of a pathogenic strain of monilia this may be recovered from the numerous miliary abscesses in the kidney which occur after approximately six days, always provided the original injection does not kill the rabbit within the first twenty-four hours. Recently, strains have been isolated by soaking the mixed growth in 5% sulphuric acid solution for twenty minutes and inoculating glucose agar slopes with the sediment from the acid. Isolated colonies obtained by either method are picked off and subcultured on glucose agar and at the same time films are made and stained by Gram's method.

## Classification.

Morphological and biochemical tests for classification have led to a variety of species being named. Serological work has simplified the classification considerably, showing that a number of previously supposed species of monilia belong to one large group, first associated with "thrush" and isolated from the mouth—*Monilia albicans*.<sup>(4)</sup>

The accompanying table shows the main characteristics of the present group.

It will be seen that the morphology of strains of the same monilia may vary in stab cultures and in slide cultures of 1% glucose agar. In the stab cultures two different types were observed, the growths resembling respectively a pine tree and a fir tree, the appearance depending on the formation of mycelia in the culture. In the slide cultures some of the strains appear to form mycelia rapidly, while others multiply by budding. Those cultures which showed mycelia after incubation for seven days at room temperature are marked with a +, the remainder which multiply by budding are marked -.

The agglutinin reactions were read after two hours at 50° C. and again after incubation for eighteen hours at 37° C. Some agglutination was present in the control tubes, but allowance was made for this factor in a final reading. The precipitin reaction was read after eighteen hours' incubation at 37° C. The end point was quite clear cut. It will be seen from the table that thirteen strains isolated from paronychia agree in pathogenicity, and that their biochemical and serological reactions are similar, though morphologically they differ in their power to form mycelia.

## Technique.

To test for pathogenicity, 0.5 cubic centimetre of an emulsion in saline solution prepared from a glucose agar "slope" culture incubated at 37° C. for twenty-four hours, was injected into the ear vein of

a rabbit. If the strain was pathogenic, in four to six days the animal was obviously weak and off its food. *Post mortem* examination at this stage reveals an extensive septicæmic infection with multiple milliary abscesses in kidney, liver and heart, from which the fungus may be recovered in pure culture.

To compare the morphology, stab cultures were made in 1% glucose agar and slide cultures prepared by melting glucose again and placing a drop on a slide with a glass rod. When cool, the drop is touched with a culture of monilia and covered with a sterile cover-slip. Slides so inoculated and kept in a moist petrie dish show the formation of mycelium, and the morphology of the strains may be studied from day to day (Figure II).

Rabbit antiserum to No. 1 monilia of the series was prepared by frequent inoculation with an emulsion killed by incubation for four days in 0.5% phenol. Three daily injections of 0.5 cubic centimetre were given intravenously, and after a five-day interval three more injections of 1 cubic centimetre and finally three injections of 3 cubic centimetres of killed emulsion. Solution for precipitin tests was prepared by washing off twenty-four hours' growth from glucose agar slopes with 10 cubic centimetres of saline solution, autoclaving the emulsion for twenty minutes and removing the clear supernatant fluid after centrifuging the tubes. This fluid gives a heavy precipitate with the antiserum.<sup>(4)</sup>

## Complement Deviation.

Antiserum was diluted one in five and heated for fifteen minutes at 56° C. This concentration was kept constant and the number of units of complement was varied. The antigens were diluted one in two—each unit volume of reagent equals 0.1 cubic centimetre and the final total volume was 0.5 cubic centimetre. The minimal hæmolytic doses of complement fixed by the antiserum and various antigens were tested and recorded. Contrary to the findings

Table showing Agglutinative, Morphologic and Pathogenic Characteristics of Strains of Monilia.

Strain Number	Source of Culture.	Maltose, Forty-eight Hours at 37° C.	Pathogenicity for Rabbit.	Appearance in Glucose Agar Stab, Three Months.	Mycelia in Glucose Agar Slide Culture, Seven Days.	Agglutination Titre with Number 1M Antiserum. <sup>1</sup>	Precipitin Reaction with Number 1M Antiserum.	Classification.
1	Paronychia.	A. and G.	+	Fir tree.	-	1 in 1,280	1 in 32	<i>Monilia albicans</i> .
2	Paronychia.	A. and G.	+	Pine tree.	+	1 in 1,280	1 in 32	<i>Monilia albicans</i> .
3	Paronychia.	A. and G.	+	Fir tree.	+	1 in 640	1 in 32	<i>Monilia albicans</i> .
7	Paronychia.	A. and G.	+	Fir tree.	-	1 in 640	1 in 32	<i>Monilia albicans</i> .
8	Paronychia.	A. and G.	+	Pine tree.	-	1 in 1,280	1 in 32	<i>Monilia albicans</i> .
11	Paronychia.	A. and G.	+	Fir tree.	+	1 in 1,280	1 in 32	<i>Monilia albicans</i> .
12	Paronychia.	A. and G.	+	Fir tree.	-	1 in 1,280	1 in 32	<i>Monilia albicans</i> .
14	Paronychia.	A. and G.	+	Fir tree.	+	1 in 640	1 in 32	<i>Monilia albicans</i> .
15	Paronychia.	A. and G.	+	Fir tree.	+	1 in 1,280	1 in 16	<i>Monilia albicans</i> .
16	Paronychia.	A. and G.	+	Fir tree.	+	1 in 640	1 in 32	<i>Monilia albicans</i> .
17	Paronychia.	A. and G.	+	Pine tree.	+	1 in 640	1 in 32	<i>Monilia albicans</i> .
19	Paronychia.	A. and G.	+	Fir tree.	+	1 in 640	1 in 32	<i>Monilia albicans</i> .
22	Paronychia.	A. and G.	+	Fir tree.	+	1 in 640	1 in 32	<i>Monilia albicans</i> .
20	Sputum.	A. no gas.	-	Fir tree.	+	Agglutination in all tubes and control.	1 in 4	<i>Monilia krusei</i> .
21	Mouth.	A. and G.	+	Fir tree.	-	1 in 1,280	1 in 32	<i>Monilia albicans</i> .

<sup>1</sup>Rabbit antiserum to number 1M monilia was used for agglutination and precipitin tests.

Sugar reactions of *Monilia albicans* group:

Maltose. Saccharose. Lactose. Mannite. Dextrose. Raffinose. Inulin. Dulcits. Levulose.  
A. and G. A. — — — A. and G. — — — A. and G.

of Stone and Garrod, our results from complement fixation were quite anomalous and are not included.

As a contrast a strain of monilia, number 21, isolated from sputum is included. Morphologically, this strain was quite different from the strains isolated from paronychia, the growth being quite dry on glucose, while the others are moist. It does not form gas in maltose, is non-pathogenic for rabbits, is agglutinated in all dilutions and also in control tube; is precipitated with a titre of one in four only with antiserum for *Monilia albicans* as compared with one in thirty-two for thirteen typical strains.

#### Monilia from Other Sources.

In addition to the above strain isolated from sputum, during the investigation monilia have been demonstrated in the lesions of *erosio interdigitalis*, superficial ulceration of the tongue (associated in this patient, recently from the tropics, with symptoms of gastro-intestinal inflammation), from moist inflamed area surrounding the anus in a diabetic patient and in epithelium at the margin of inflamed areas round the toes. In three of these cases the potash preparation showed typical delicate mycelium and groups of spores.<sup>(5)</sup>

#### Diagnosis.

In the cutaneous type of disease the criterion for a diagnosis of monilliasis consists of the finding of the organism in the scales or roofs of vesicles (in fresh potash preparations) in the form of mycelia and clusters of spores. The microscopic picture is always suggestive and not observed in scrapings from normal skin or from lesions of a non-mycotic character.

In culture one must judge of the comparative abundance of monilia in the growth, as monilia may be found as contaminants in many superficial infections.<sup>(5)</sup> Further work on classification is necessary to determine pathogenicity.

#### Treatment.

In the true paronychia without infection of the nail the treatment consists in keeping the lesions dry and applying antiseptics to the nail wall. Rubber gloves should be worn to prevent the hands becoming sodden when washing up dishes or washing clothes. Of the various antiseptics used, "Monsol", as suggested by Dr. Barber, of Guy's Hospital, has proved the most efficient for general use. Pure carbolic and saturated solution of chrysarobin in spirit have been used also, but need

greater care and personal application by the physician. A pointed wooden match is dipped into pure "Monsol" and inserted into the pocket between the nail wall and the nail and moved across the nail. Treatment is continued twice a day till the inflammatory symptoms subside. Small doses of X rays are useful in obstinate cases. When the nail is infected it is necessary to remove it under general anaesthesia and to dress the nail bed daily with pure "Monsol" or iodine till regrowth of the nail occurs. These nail infections are almost as persistent as those due to ringworm.

#### Summary.

Pathogenic monilia have been isolated from thirteen cases of chronic paronychia and identified as *Monilia albicans*. Diagnosis and treatment of the condition have been briefly discussed.

#### Acknowledgments.

My thanks are due to my colleagues, Miss F. E. Williams and Miss M. McKie, of the Walter and Eliza Hall Institute, for much help during the work, and also to the courtesy of Dr. Wettenhall and Dr. Kelly for access to the patients at the Melbourne Hospital.

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#### REPEATED LUMBAR PUNCTURE IN EPILEPSY.<sup>1</sup>

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THE value of lumbar puncture in *status epilepticus* and allied convulsive conditions was in 1926 the subject of a report by Guy P. U. Prior and the writer,<sup>(1)</sup> and at that time the following case was included.

For years this patient had been deteriorating in spite of treatment. For six months he had averaged sixty-

<sup>1</sup> Read at a meeting of the Central Northern Medical Association, New South Wales, on May 23, 1933.



FIGURE II.

*Monilia albicans* from paronychia. Slide culture unstained showing mycelium and typical budding.



three fits per month. After lumbar puncture the fits ceased for four days, followed by two fits on successive days. Puncture was repeated, and during the next month he had sixteen fits. At the end of this month he was again submitted to lumbar puncture, with a further reduction to twelve for the following month. Previous to the second puncture the patient was dull, hypotonic and inert, suffered from anorexia and was losing weight rapidly. He became lively, a keen eater, interested in his environment, and so mischievous as to be a nuisance and a torment to other patients.

Since then fourteen other epileptic patients have been submitted to lumbar puncture monthly, and two at fortnightly periods, for periods of nine months. With the patient lying on the left side the cerebro-spinal fluid was drained until the flow in drops varied with the respiration. The maximum amount removed was 40 cubic centimetres, and the minimum 8 cubic centimetres. The pressure was above the normal 200 millimetres of water in each case. No constant ratio could be observed between the amount removed at the first and subsequent punctures, whilst the pressure also fluctuated irregularly. The Bolz reaction was slightly positive in every case at the first puncture and completely failed to occur thereafter.

The patients were in no wise a selected group. For obvious reasons, only those willing to submit to the treatment were chosen, and this meant that they were the more deteriorated patients, dull and demented, and with a high threshold for pain. No change was made in the diet, nor in the medicinal treatment of the patients, all of whom had been for at least a year previously on a mixture consisting of potassium bromide and sodium bichlorate, 0.6 gramme (ten grains) three times a day. Apart from twenty-four hours' rest in the prone position following the punctures (a *desideratum* by no means always obtained in these patients), the environment and diet remained the same as for the other epileptics in the same wards, who could thus be used as controls and who showed no constant change in the number of fits during the same period. Of those submitted to the treatment, in two cases only was there a failure to obtain a definite reduction in the number of fits. In the other patients the decrease varied from 11% to 64%, with an average decrease for all cases of 29%, as is shown in the accompanying table.

Case Number.	Average Number of Fits per Month Before Treatment.	Average Number of Fits per Month During Nine Months Treatment.	Percentage Reduction.
1	22.0	10.5	52
2	4.5	3.5	22
3	17.0	14.5	15
4	11.0	4.0	64
5	7.5	3.0	60
6	3.0	2.0	—
7	5.0	5.5	-10
8	6.5	5.0	23
9	27.0	15.0	44
10	5.5	4.0	27
11	18.0	9.0	50
12	4.0	2.5	37
13	21.0	14.0	33
14	4.5	4.0	11
15	90.0	53.0	35
16	62.0	42.0	33

Of the sixteen patients, all were middle-aged, with the exception of patients 15 and 16, who were male adolescent epileptics with associated congenital mental deficiency. In both cases there was seen the same improvement in the mental and physical condition as was described in the original patient—a progressive gain in weight and an improvement in mental alertness. Patient 16 gained 12.6 kilograms (two stone) in five months, and for the first time for five years became able to carry on a conversation. No physical or mental change was noted in the older patients.

The reduction was not progressive in any case, but it was noted that there was a greater reduction in fits during the fortnight following each puncture than in the second fortnight of the month. Patients 15 and 16, who were submitted to puncture fortnightly, show a very definite improvement. The greatest proportional reduction is seen in those patients having the greater number of fits.

The actual mechanism whereby this improvement has been brought about is doubtful. Since the above investigation was carried out, it has been noted that Vicenti Dimitri<sup>(2)</sup> also found a definite increase in the pressure of the cerebro-spinal fluid in epileptics. He suggested that lumbar puncture might reduce the number of fits, apparently implying that this increase in pressure had a causal relationship with epilepsy. If this were so, we would expect epileptiform convulsions to be a more constant phenomenon in increased intracranial pressure than they actually are.

Riser<sup>(3)</sup> has found that following lumbar puncture it took one hour to replace each ten cubic centimetres of the fluid removed. As in the above series, the maximum amount removed was forty cubic centimetres, this amount would thus be replaced within four hours, unless the rate of formation of the cerebro-spinal fluid is different from the normal in epileptics. This is unlikely, as in three cases lumbar puncture was performed by the writer on two successive days after thoroughly draining the fluid at the first puncture, and in each case more fluid was obtained at the second puncture than at the first, and the pressure remained above normal. It is improbable, therefore, that the improvement can be attributed to diminution in pressure, and for the same reasons it cannot be attributed to any lasting dehydration of the cranial contents. Also D. Ewen Cameron<sup>(5)</sup> forced the amount of fluid taken by epileptics without obtaining any definite effect on the number of fits, and found that dehydration had an adverse effect on the patients without reducing the number of fits.

It was thought that it may have been through the vascular system that the above results were obtained. Block and Oppenheimer found that when cerebro-spinal fluid is withdrawn in the normal, there is a fall of blood pressure proportional to the amount removed. A series of fifteen epileptics were therefore investigated, and this statement was confirmed. There was a preliminary rise of blood pressure, lasting up to one hour after the puncture

and probably due to emotional disturbance. Following that there was a drop to a level averaging 7.5 millimetres and 10.5 millimetres below the original systolic and diastolic pressures respectively. This fall was maintained for as long as five days in some cases. However, there was also noted a definite hypotension in all cases but one before the lumbar puncture was performed, the average systolic blood pressure being 114 and the diastolic 68 millimetres of mercury, agreeing with the finding of K. Paddle,<sup>(1)</sup> who found definite hypopnea in 70% of epileptics, and of Vicenti Dimitri.<sup>(2)</sup> Dimitri, however, obtained good results in epilepsy by raising the blood pressure. It would seem, therefore, that the improvement in our cases occurred in spite of, rather than because of, the effect on the already low blood pressure. Also it would appear that the statement that "usually high pressure in the arterial system is associated with high pressure in the cerebro-spinal fluid"<sup>(4)</sup> does not apply to epileptics.

It is considered that the good effects of the repeated withdrawal of cerebro-spinal fluid can be attributed only to the removal of some toxic substance of the nature of which we are still ignorant, as we are of its mode of action. None of the other theories of the causation in epilepsy can in any way be regarded as explaining the above results.

#### Summary.

1. The effect of repeated lumbar puncture as a means of diminishing epileptic fits is described.
2. Decreased intracranial tension and alteration in blood pressure are eliminated as explaining this result.
3. The removal of a hypothetical toxic substance is considered to be the most feasible explanation.

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## Reviews.

### DETERMINATION OF SEX.

Will it be a boy or a girl? This question, so full of interest to human parents, and the parallel query so very important economically to the animal breeder, has been provocative of all sorts of weird theories, many of which still find supporters.

The little book "Sex Determination", by F. A. E. Crew, does not concern itself with any of them.<sup>1</sup> As the author puts it in the preface: "All these theories have in common one grave disqualification: they are not in accord with established fact."

The mechanism which determines whether an egg shall develop into a female or a male has been the subject of

much study on the part of the biologists of the last fifteen years, and with amazing success. In fact, the biological discoveries in this field have proved so stimulating in conjunction with the investigation of the mechanism of heredity, that they have almost played the same part in modern biology as the analysis of the atom in physics. To anyone familiar with the results there is nothing at all surprising in the scorn so often exhibited by the modern biologist at the old tales, which still find favour with those who should know better.

In by far the majority of cases it can be simply stated that the sex of the offspring is fixed at the moment of fertilization, and it results from the complement of chromosomes in the fertilized egg, which is the sum total of those originally present in the ripe egg plus the set brought in by the fertilizing sperm cell. In the case of man, and a considerable number of other animal groups, the eggs, from the sex point of view, are all of one kind. There are, however, two kinds of sperm cells—male determiners and female determiners. If an egg is fertilized by one sort of sperm cell, a male results; if by the other kind, it grows up into a female. If the two kinds of sperms are produced in equal numbers and have equal chances of fertilizing the eggs, the ratio of the sexes should be 100:100. Various causes may, however, upset this sex ratio.

Recent research has shown exactly how, under certain circumstances, the original sex may be reversed. It has also explained how in invertebrate animals, and rarely in vertebrates, abnormalities may occur, such, for example, as gynandromorphism, in which one side of a creature is male and the other female, or intersexualism, in which the organism, after starting its development as, say, female, completes it as male.

The study of sex determination has reached such a stage that a very considerable number of recent papers would have to be read in order that an interested inquirer could orientate himself and discover exactly how the matter stands today.

It is very doubtful, however, whether Professor Crew's admirable little book will be of much use to those altogether unfamiliar with modern cytology or genetics. It is one of an excellent series of monographs published by Methuen and Company, London, in which authoritative accounts of the present state of knowledge in various departments of biology are set forth by experts. There can of necessity be little or no room for elementary explanations, and the reader is supposed to be somewhat familiar with the subject. For those, however, who are interested in animal breeding, or for the general reader who has had some instruction in cytology or embryology, the book under review provides a very useful summary of the present position and includes a useful bibliography.

A little more might have been said regarding the interrelation between certain of the ductless glands (excluding the reproductive organs) and the development of the secondary sexual characters; and an illustration or two might have simplified reading, saved an equivalent space of verbal description, and entailed no extra cost.

For the advanced student in biology or medicine we can recommend this inexpensive work.

### THE AGED AND THEIR DISEASES.

F. MARTIN LIPSCOMB has rendered a service to practitioners of medicine in presenting his book, "Diseases of Old Age".<sup>1</sup> In it he gives the more important facts concerning the illnesses of the senium. The material has been collected from his own experience as Deputy Surgeon of the Royal Hospital, Chelsea, as well as from the meagre literature on the subject. He deals chiefly with the clinical aspects of the more common diseases of old age and spends little time in the discussion of their etiology or pathology.

The book is of practical value, and should be of assistance to any practitioner wishing to investigate the subject; it will be of special usefulness to young house surgeons taking appointments in hospitals for the treatment of the aged.

<sup>1</sup> "Sex Determination", by F. A. E. Crew, M.D., D.Sc., Ph.D.; 1933. London: Methuen and Company, Limited. Foolscap 8vo., pp. 138. Price: 3s. 6d. net.

<sup>1</sup> "Diseases of Old Age", by F. M. Lipscomb, M.R.C.P.; 1932. London: Baillière, Tindall and Cox. Crown 8vo., pp. 474. Price: 12s. 6d. net.

## The Medical Journal of Australia

SATURDAY, SEPTEMBER 2, 1933.

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### TEACHERS IN MEDICINE.

EVERY member of the medical profession is, or should be, both a teacher and a student. Undergraduate days are generally described as student days, though studentship continues throughout the life of every medical practitioner. There is no standing still in medicine; once the habits of study are dropped, progress, to use an Irishism, is in the backward direction. Every medical practitioner knows this. But every medical practitioner does not realize that he has the obligation of teaching. This obligation is twofold. He is in duty bound to hand on to his brother practitioners any new discoveries he may make in clinical or scientific medicine, or any views he may have formed as a result of study or observation. He also has the duty of teaching his patients how they should order their lives to maintain health and combat disease. Teaching of this kind is not highly specialized and is not generally included in teaching as applied to medicine. Teachers of medicine include those who hold university posts as professors, as clinical

lecturers and as tutors, and also those who undertake to give post-graduate instruction. It has probably never occurred to university senates, to hospital boards, or to the bodies controlling post-graduate instruction that no evidence of ability to teach is sought from an applicant before he is appointed to a teaching post. In primary and secondary schools teachers have to undergo a course of training before they are entrusted with the teaching of pupils. In the realm of medicine it would appear that anyone is thought to be able to teach, and appointments are made to teaching posts on the tacit assumption that the necessary ability has been acquired with the conferring of a degree at graduation.

Any medical practitioner who looks back to his undergraduate days, will remember some of his teachers who always held the attention of their students, who knew how to impart knowledge, and who made the student think for himself. He will also remember teachers who had made names for themselves in either the science or art of medicine and who enjoyed authority and yet who were not successful teachers—they made little attempt to assemble their facts in any coherent sequence, and their words, uttered with a dull and flat drone, had often a somniferous effect. The same thing obtains at the present time in universities, hospitals and post-graduate classes.

Teachers are born, it is said, and not made. At the same time, though the magnetic personality of the born teacher may be lacking, medical practitioners who are faced with the necessity for teaching undergraduates or brother practitioners can do a great deal to improve their methods. The first requisite in a teacher is that he must know his subject; secondly, he must marshal his facts in a logical sequence; thirdly, he must know the rudiments of the King's English; and lastly, he must have some knowledge of the art of speaking. If a man is ignorant of his subject, he should not presume to make the attempt of teaching. The other requisites he can master if he will. He can be instructed in the preparation of his matter. He can learn to use correct words instead of the jargon of the ward or laboratory, combined, as it often is,



with the most hopeless grammatical solecisms. He can take a course of training in elocution. We wonder how many so-called teachers have troubled about any of these things. Some of the best known medical teachers in Australia owe their success to concentrated effort, particularly with a master in elocution. Since ability to teach is so important, it is obvious that no one should be appointed to a senior post until he has given evidence of that ability. Further, senior teachers, professors, lecturers and others, provided, of course, they themselves have studied the art of teaching, should insist on a practical demonstration of teaching methods by applicants for junior positions. They should also make it their business to listen to their juniors giving a lecture or a demonstration and to show them how their methods might be improved. Post-graduate committees should be careful to discover which of their lecturers and demonstrators belong to the dull droning or the pompous and verbose types, and omit them from all future programmes. If we do not teach our teachers, they will not be able to teach their pupils.

## Current Comment.

### CARDIOSPASM.

THE name "cardiospasm" is perhaps not the most suitable that could be found for the curious functional disturbance of the œsophagus that it labels. The word assumes the existence of a spasm in the sphincter near the cardiac end of the stomach. But it cannot be stated positively that there is a cardiac sphincter at all; eminent authorities may be quoted both for and against its existence. Moreover, it is by no means certain that any true muscular spasm occurs.

M. Sturtevant has recently reviewed the literature and discussed cases illustrating this interesting condition.<sup>1</sup> In his historical retrospect he summarizes the progressive advances in knowledge and changes in viewpoint. The spasmodic element was first realized and recorded in 1733, but dilatation of the œsophagus was not recognized till 1821. Sufficient emphasis is laid on dilatation in modern writings for the name "mega-œsophagus" to be employed. The fact that a dilated œsophagus was not found in cases in which organic obstruction was present attracted the notice of clinicians, and against this was placed the total absence of organic

stenosis in cardiospasm. The various attempts to explain this state of affairs are interesting. Some writers postulated a primary atrophy of the œsophageal muscle; others suggested various vagal disturbances. The latter hypothetical conditions ranged from irritation of the vagus by badly masticated food to essential vagotonia plus intrinsic stimulation of the vagus by various reflex abdominal causes. Vagal degeneration has been both described and denied. Then Hurst came forward with the theory that there was not a true spasm present, but rather a failure to relax, and his chosen name, "achalasia", embodies this idea. He advances histological evidence (based on autopsy findings) of degeneration in the nerve plexus of Auerbach. Infection of this same structure has also been described. Now this chronological survey seems to point to a progressive accretion of knowledge leading to the truth. But we have to remember that so distinguished an authority as Jackson will not admit the existence of a true sphincter of the cardia. He speaks of the pinchcock action of the crura of the diaphragm, and suggests the name "phrenospasm" as more truly descriptive. Further, there are earnest advocates of a psychogenic cause for the condition. There does seem to be some reason for their contention in certain instances. Plummer and Vinson, after studying 300 cases, conclude that there was an underlying neurosis in those cases in which no œsophageal dilatation was present; when mega-œsophagus was found they considered that the psychic factor was negligible.

This problem thus appears to resemble the temporarily popular jig-saw puzzle; the picture is sufficiently complete for the design to be intelligible, but there are yet a few odd pieces that as yet have not been correctly placed. Sturtevant marks out the three stages of this disorder. First comes resistance of the cardia to food; this is followed by dilatation, and lastly, regurgitation of food occurs. He illustrates from his cases the important point that dysphagia is not an invariable complaint. Pain was not uncommon in his series. This may be troublesome or may be little more than a sense of constriction. Its location is usually in the thorax or upper part of the abdomen. The physical signs are of little help. Various signs have been described, such as the absence of the second swallowing sound, and dulness to the right of the sternum, which disappears when the œsophagus is full of air. These are not to be relied upon; the history is much more helpful. Two other methods are available for clinching the diagnosis: radiological study and œsophagoscopy. Radiological examination will indicate both the fact of obstruction and the degree of dilatation. Œsophagoscopy should be performed only by an expert, but will yield the same valuable information.

As regards treatment, the antispasmodic drugs, such as atropine, appear to be of little use. This applies with special force to those cases in which there is definite dilatation of the œsophagus. Here some form of surgical relief is necessary. This may

<sup>1</sup> Archives of Internal Medicine, May, 1933.

be gained by stretching the cardia, either through the incised stomach or, more conservatively, by means of one or other of the various bougies or hydrostatic dilators devised for the purpose. The latter method is practically universal now, but it must be remembered that it is a manœuvre for the practised hand only. Accidents have occurred, for the muscle wall is sometimes reduced to a papery thinness, a condition that also reduces the chance of complete relief in advanced cases. Ideally, advanced cases should never be seen. The history is usually a very suggestive one, enabling a careful observer to arrive at a tentative diagnosis at a comparatively early stage. It is important that this should be done, for only thus may the patient be safely and satisfactorily relieved.

#### THE FIRST HEART SOUND.

THE heart sounds afford a good instance of the mystery which surrounds many familiar phenomena. How many observers must have listened to the heart sounds, analysed them and drawn conclusions, warranted and unwarranted, from them? And yet argument is still proceeding as to the exact causation of the first sound. The usually accepted explanation is that it is produced partly by contraction of the ventricular muscle and partly by closure of the auriculo-ventricular valves. A considerable amount of experimental work has been done on the subject, but opinions still differ. There are certain clinical observations that must be taken into consideration also. For example, the curious and characteristic accentuation of the first sound in mitral stenosis is well known. Also the variability of intensity of the first sound in complete heart block has engaged the attention of many observers.

William Dock has carried out an experimental study on the production of the first cardiac sound, and in a paper on the subject reviews the whole available evidence.<sup>1</sup> His contention is that this sound is solely due to the rapid tensing of the leaflets of the auriculo-ventricular valves. If this is true, the factors governing the loudness of the sound are the degree of tension in the valves at the moment of ventricular systole and the rate of rise of tension within the ventricle. His experiments were carried out on anesthetized dogs. He exposed the heart by opening the thorax and maintained artificial respiration.

The vibrations associated with the production of the heart sounds were graphically recorded, and electrocardiographic tracings were taken simultaneously. By tightening a cord slipped around the auriculo-ventricular groove the ingress and egress of blood between auricles and ventricles could be blocked, the ventricles being thus caused to contract isometrically. By clamping the great veins contraction of the empty heart could be produced

and recorded. Fibrillation of the ventricles could be produced by injection of a digitalis preparation. It will be seen that the ventricular contractions could be studied under varying conditions. Rapid action of the ventricles in no wise impaired the intensity of the first sound, but fibrillation abolished it. Isometric contraction, that is, against resistance, but without alteration in length of the contracting fibres, greatly diminished the sound or caused its disappearance. Contraction of the empty heart likewise produced silence during the phase of ventricular activity. These observations would seem to negative the rôle ascribed to the ventricular muscle in producing the first heart sound. Dock quotes recent observations of Schutz and Frey on the same subject. These writers conclude that the active tensing of the heart wall around its incompressible fluid content releases vibrations of frequency and intensity competent to produce sound. Dock is prepared to accept this suggestion, provided that the region in which the vibrations arise is restricted to the valvular apparatus. In his ligature experiment he considers that the absence of the sound is due to the fact that the valve rings are puckered by the cord, and that the usual sudden tensing does not occur. He quotes Palfrey and Cabot as comparing the quality of the first sound with that produced when a handkerchief held by the edges is suddenly drawn taut. This illustrates the mechanism which he believes to be solely responsible for the sound. If we accept this, we may explain the variable intensity of the sounds in complete heart block. This variability is probably due to the contraction of the ventricles at moments when the auriculo-ventricular valves are in varying positions, owing to the lack of coordination between auricular and ventricular activity. If the valves are near the point of closure, a more rapid rise of intraventricular tension will occur, with a proportionately louder first sound. The sharp sound heard in cases of mitral stenosis would probably be related to prolonged forceful auricular systole and a ready tensing of the more rigid valve leaflets.

Dock's experiments seem to discount the importance of the muscular factor in causing the first heart sound. Of course, even if the sound is solely due to the sudden application of a high degree of tensile stress to the previously slack fibres of the auriculo-ventricular valves, the muscle of the ventricle still plays a part, for it contributes materially to the rate at which intraventricular tension will rise. But the mere act of muscle contraction apparently in itself causes no vibrations that may be translated into sound. The clinician of these days does not draw exaggerated deductions concerning the state of the cardiac muscle from the sounds he hears through a stethoscope. But the type and intensity of the sounds are still a guide to him in arriving at a true view of the circulatory functions. Therefore a correct physiological basis for his observations and conclusions is essential.

<sup>1</sup> Archives of Internal Medicine, May, 1932.

## Abstracts from Current Medical Literature.

### BACTERIOLOGY AND IMMUNOLOGY.

#### Serological and Cultural Studies of Meningococci.

BESS E. SEGAL (*Journal of Infectious Diseases*, January-February, 1933) reports the result of an examination of one hundred strains of meningococci. The strains were obtained from various sources; all were isolated from cerebro-spinal fluid in cases of meningitis and all were Gram-negative diplococci, and according to growth and colony formation were considered to be indistinguishable from the type strains used by the National Institute of Health, Washington. By agglutination and absorption tests thirty-six strains were found to be Type 1; ten strains were Type 2; twenty were Type 3 and twelve Type 4. Seventeen strains were found to differ serologically from any of the known types. By agglutination and absorption tests they were shown to form a separate group distinguishable from the Gordon type strains. The cultural and biochemical reactions were not considered sufficiently distinct to warrant the strains being placed apart as a new species, but since the four existing Gordon types are differentiated purely on the basis of serologic differences, it was suggested that these seventeen strains should be considered as belonging to a fifth type.

#### Classification of Haemolytic Streptococci by Agglutination.

J. HOWARD MUELLER and KATHERINE S. KLIRE (*Journal of Infectious Diseases*, April, 1933) record their results in attempting a classification of haemolytic streptococci by agglutination. Most of the strains examined were obtained by culture from scarlet fever patients or from patients in wards where scarlet fever had developed. The method of agglutination is based on the observation that a small amount of normal serum added to broth in which streptococci have been grown usually yields a culture that suspends readily and does not agglutinate spontaneously. The use of normal horse serum in the saline solution for the dilution of the antisera tends further to exclude the settling out of the suspension. Details of the technique employed are given. Two hundred and fifty-five strains of haemolytic streptococci from throats of scarlet fever patients were examined and the sera used were produced from strains chosen at random from the series; from these six were selected as representing distinct strains. Four of these appeared to be identical with the four types established by Griffith, and three of these with Types I and II and Subtype I of Williams. Two-thirds of the strains

examined fell into the six well-defined groups. Usually only one type was obtained from each patient, but occasionally two different types were recovered. As a preliminary to the investigation a large series of normal throats were examined for the presence of haemolytic streptococci, principally from patients, nurses and staff in a large obstetric hospital. Of some five thousand patients only 4% to 5% had haemolytic streptococci in their throats, while among the nurses and staff invariably 25% to 35% were carriers of these organisms. Agglutination studies of these streptococci occurring in healthy people proved them to be extremely heterogeneous, and such strains seldom became agglutinated with the selected type sera.

#### The Common Cold in an Isolated Arctic Community.

J. H. PAUL and H. L. FREESE (*American Journal of Hygiene*, May, 1933) summarize their conclusions after an investigation of the common cold in Spitsbergen as follows. A year's observation of respiratory diseases in the arctic mining town of Longyear City, Spitsbergen, indicates that the "common cold" is initiated by one or more specific infective agents, and that the disease is spread by direct contact. The incubation period appeared to be about forty-eight hours. The clinical course of the disease varied in different individuals who had presumably been exposed to the same "virus". Some persons seemed to have a complete immunity, while others developed an immunity of short duration after an attack. This period was not shorter than twenty-three days in the series, and averaged seven weeks in the forty-nine persons who had had more than one attack at the time of the departure of the authors. The distribution of cases of the "common cold" by season was quite different from that reported for the temperate and tropical zones. The arrival of the first boat of the shipping season was followed by a sudden epidemic which involved almost the whole community in a short period of time. These epidemics are of annual occurrence. The study of the authors indicated that an unfavourable environmental factor, such as a sudden drop in atmospheric temperature, is not necessary for the development of an epidemic. The study showed that the bacterial flora of the naso-pharynx did not play any significant rôle in the initiation of the "common cold". Cultures from normal persons in Longyear City showed striking similarity to those obtained in the tropics and the temperate zone. The chief difference was that staphylococci and haemolytic streptococci were virtually absent in the Spitsbergen population. This study confirms the fact that the fixed types of pneumococci and haemolytic streptococci are rarely encountered in isolated communities. It also indicates that the various other groups of aerobic organisms isolated must be considered

as normal inhabitants of the naso-pharynx, since they occur in approximately equal percentages in normal throats in widely scattered geographical areas.

#### The Recovery of *Bacillus Typhosus* from Faeces and its Preservation.

LEON C. HAVENS and CATHERINE R. MAYFIELD (*Journal of Infectious Diseases*, March-April, 1933) describe a medium effective as a preservative of *Bacillus typhosus* in faeces, and one which has an inhibitory effect on normal faecal flora. Bile to which 0.5% lithium chloride was added was selected as the preservative which proved most satisfactory, as in this *Bacillus typhosus* grew luxuriantly, while other faecal flora were inhibited. The best results were obtained when the pH of the bile was kept at about 4.6. As an isolation medium lithium chloride 0.5% to 1% added to plain or Endo agar almost completely prevents the development of colonies of *Bacillus coli*, while colonies of *Bacillus typhosus* are very greatly increased in numbers. The motility of *Bacillus typhosus* on lithium chloride media is usually lost, and the colonies are smaller, more compact and less translucent. Repeated platings from specimens of faeces over a period of several days result in a significant increase in the number of positive results obtained.

#### The Virus of Poliomyelitis.

HAROLD K. FABER and LOUIS P. GERHARDT (*Journal of Experimental Medicine*, June, 1933) have investigated the localization of poliomyelitis virus produced by intranasal inoculation in monkeys, and summarize their conclusions as follows. (1) About four days after intranasal instillation the virus of poliomyelitis establishes its initial focus within the central nervous system in the olfactory bulbs. It apparently reaches this structure through the axones of the olfactory nerves after primarily infecting the olfactory cells of the nasal mucosa. (2) From this initial focus the virus spreads (on the fifth and sixth days) through the olfactory tracts and their connexions in the brain stem. A secondary focus in the hypothalamus is first established. From this two main channels can be discerned: first to the medulla, second to the thalamus and mid-brain. (3) On the seventh day virus can first be detected in the spinal cord. It is widespread, but is found in larger amounts in the cervical than in the lumbar segments. It is present in both the anterior and posterior horns, either in equal amounts or in slightly larger amounts in the posterior. It is also present in the intervertebral ganglia. The surmise is presented that the main route of infection of the cord is not from the medulla (which had been infected as early as the fifth day) but along the sensory tracts, presumably from the thalamus. (4) Certain portions of the central nervous system were never found to contain demonstrable quantities of virus;



these were the cortex of the frontal and parietal lobes and the cerebellum. The olfactory cortex was only once found to contain virus; this occurred on the seventh day, and in small amounts, and presumably had its source in the olfactory bulbs. (5) The experiments of the seventh day suggest that virus had died out in areas previously infected (in the hypothalamus and thalamus particularly) while continuing, apparently undiminished, in the mid-brain and medulla, and spreading to the cord. These observations are in harmony with the general contentions of Fairbrother and Hurst, that virus is better adapted to survival in the lower portions of the cerebro-spinal axis than in the higher. (6) The conception presented of the manner of entrance and routes of propagation of the virus of poliomyelitis in the experimental animal appears to be in essential agreement with the clinical and pathological characteristics of the disease in man.

#### HYGIENE.

##### Food Poisoning with Duck Eggs.

W. FROMME (*Deutsche Medizinische Wochenschrift*, April 28, 1933) states that widespread research is necessary in order to determine the frequency of the occurrence of enteritis bacilli in ducks. These bacilli can be shown in cloacal smears. Fromme summarizes his observations as follows: (1) Twenty-five group infections from food poisoning were observed in one year. One hundred and forty-three persons became ill and two of them died. This illness was definitely associated with the domestic use of duck eggs. (2) It is therefore concluded that the transmission of food poisoning by duck eggs can no longer be doubted. As the cause of the disease in an overwhelming majority of cases *Bacillus enteritis* Breslau and Gärtner were found. (3) Ducks can become ill by taking up enteritis bacilli and then become bacilli excretors. In this disease a certain type of duck (Kaki Campbell) appears to be responsible. (4) The spread of the enteritis bacilli occurs through the contents of the egg. However, it appears also possible that a clinging enteritis bacillus to the outer shell may spread the disease. The author suggests that the following prophylactic measures should be adopted: (a) Notification of all cases of food poisoning. (b) A warning against eating raw duck's eggs should be issued. (c) The disinfection of duck eggs in all egg shops. (d) A systematic search for enteritis bacilli in ducks.

##### Complement Fixation in Experimental Amoebiasis in Dogs.

C. F. CRAIG AND EDWIN KAGY (*American Journal of Hygiene*, July, 1933) write that the complement fixation test for infection with *Endamoeba histolytica* has proved useful in the diagnosis of obscure cases of intestinal amoebiasis and amoebic abscess

of the liver and is being used in suitable cases as a routine test by clinicians. The dog was used as an experimental control. The antigen employed was an alcoholic extract of forty-eight hour old cultures of *Endamoeba histolytica*. Infective mucus from upper colonic levels was transferred, by use of a pipette and bulb, *per rectum* to the ileum of a second dog whose lower bowel had been previously cleared by an enema. Definite acute amoebic colitis was produced and later verified *post mortem*. Complement fixing bodies were demonstrated in the blood serum of experimentally infected dogs, but in none of the controls. Their appearance took place as early as three days after inoculation and in the majority within fifteen days. Early reactions corresponded to severe and widespread amoebic ulceration of the intestine. The reaction disappeared from the blood serum of infected dogs soon after recovery from the infection. It is specific for such infection.

##### Diphtheria Immunization in Private Practice.

G. W. ANDERSON AND G. H. BIGELOW (*American Journal of Public Health*, July, 1933) state that in Massachusetts toxin-antitoxin is supplied by the State to all boards of health and physicians free of charge, physicians receiving packages of three one cubic centimetre ampoules. Returns are furnished with regard to 35 cities and towns with a total population slightly in excess of 2,000,000. A comparison is made of the immunization rate per year per thousand of the population as carried out at the various State clinics with the employment by private practitioners of toxin-antitoxin. Allowing for inevitable wastage as compared with the amount distributed, the fact remains that the amount of immunization in private practice varies directly with the intensity of the official efforts, even though free service has been obtainable in public clinics. A progressive decline in the diphtheria case rate to a little more than half in seven years appears to be directly influenced by the immunization work conducted in clinics and private offices, the reduction varying in amounts according to the amount of toxin-antitoxin employment. That official activity has created a demand for immunization in private practice seems undoubted.

##### The Relation of Actinic Intensity of Sunshine to Minimal Wave Lengths.

F. O. TONNEY, G. L. HOFF, AND F. W. DE YOUNG (*American Journal of Hygiene*, July, 1933) discuss the relation between actinic intensity of sunshine and minimal wave lengths. As solar actinic intensities capable of decomposing 3.5 to 3.7 milligrammes of oxalic acid marked the threshold of the erythema skin reaction, and as erythema and antirachitic rays in sunshine are identical in wave length, the minimal wave lengths were studied by spectrographic methods.

Hourly studies were also carried out for one year, and an additional winter testing was made by the actinic method, the spectrograph and the erythema reaction both in rural and urban districts. Using a single prism quartz spectrograph with an adjustable collimating lens, 60° prism, and a camera lens, the authors took photographs of the spectral lines with panchromatic plates developed in total darkness. The instrument was calibrated against known spectra, mercury and argon, the Fraunhofer "K" line being used as a base for measurement. The graph of hourly actinic intensities and minimal wave lengths per hourly average per month shows a close correspondence, findings for both falling within the area of standard deviations. Winter readings proved less concordant. The authors consider that this may explain the variable results obtained in both babies and laboratory animals by exposure to direct sunshine in the prevention of rickets. The erythema range for sunlight found extended from the lower limit of solar radiation to an upper limit of 3,060 Angström units, the maximum lying below 3,030 Angström units. The positive erythema reactions grouped almost exclusively with readings of 3.5 to 3.7 milligrammes of oxalic acid decomposed. In climatic surveys for public health purposes the actinic method is sufficiently dependable as an estimation of sunlight, and both the physical and erythema readings may be dispensed with, cost and inconvenience being saved.

##### Smoke Abatement.

M. M. COHN (*American Journal of Public Health*, July, 1933) states that the whole progress of air hygiene is comparatively new in civic progress. The most vigilant smoke detection cannot produce an unharmed skyline. What is first needed is a "smoke-conscious citizenry". Schenectady, a manufacturing city of 97,000 inhabitants, has regulated its growth in accordance with a zoning code since 1927. Three zones of unrestricted manufacture are designated as zones of unrestricted smoke, otherwise strict smoke control was established except over residences. In 1928 smoke over residences was brought under control. It can be established as an axiom of smoke abatement that "the more visible the staff of inspectors, the more invisible the smoke". Fire prevention inspectors have been included as smoke inspectors. This meant a universal control. Smoke of greater density than Number 3 on the Ringelmann chart was not permitted for more than seventy-five seconds of any one hour, except when fires were being started or cleaned. A six-minute smoke production was permitted per hour under such conditions. Technical advice has helped to increase the change of fuel to small size anthracite coal or non-smoking types of bituminous fuel. A successful smoke abatement at remarkably low cost is claimed.

## Special Articles on Treatment.

(Contributed by request.)

### XVI.

#### THE TREATMENT OF PNEUMONIA.

STUDENTS of the past decade were advised that the essentials of the treatment of pneumonia were good nursing, and the administration of abundance of fluid. Little has occurred to alter this dictum in either detail and there is probably no other disease in which the services of a competent, well-trained nurse are so valuable or necessary.

Pneumonia is in many cases a self-limited disease and if the patient's general condition can be assisted to weather the storm, resolution in some form or other will occur.

#### General Care of the Patient.

The rigid enforcement of the semi-upright posture is meeting with much opposition, as is much of the hide-bound conventional therapeutics. The posture of the patient matters little so long as it is a comfortable one. Everything should be subservient to the necessity for quietness and sleep. The room should be an airy one with freedom from draughts; the patient should be warmly clad, but not overburdened with clothes. Many dispense with pneumonia jackets, no matter what they are made of, as they make nursing considerably more difficult owing to the fact that they must be re-adjusted before examination or sponging and thereby cause unnecessary distress. Plasters of kaolin are for this reason losing favour as a routine application and are being reserved for the relief of pain.

The chest having been thoroughly examined and the medical attendant having satisfied himself of the presence of a pneumonia, further examination should be restricted to the anterior aspect of the chest until the physician considers further investigation necessary. For this reason the use of a garment opening down the front, as well as down the back, is desirable, so that examination does not entail any discomfort to the patient.

Whereas formerly it was the custom to sponge a patient whose temperature rose to 40° C. (104° F.) or higher, modern tendency in this regard is to sponge the patient if he be uncomfortable, but not as a matter of routine, and to use this therapy in a more rational manner to induce sleep.

#### Pain and Sleep.

Pain may be present at the onset of the attack, subsiding in twenty-four hours, and thus call for but little treatment, applications of mustard or one of the many forms of *cataplasma kaolini* giving relief.

On the other hand early pleural involvement may cause severe and persistent pain. Codein 0.03 to 0.06 gramme (one-half to one grain) by mouth may be of some assistance or amidopyrin in 0.45 gramme (seven and a half grain) doses combined with potassium bromide may prove effective. The latter mixture of drugs tends to be depressant when repeated. Should the pain produce restlessness and insomnia, it may be necessary to resort to some form of opium. There are those who will not administer morphine until after the crisis on account of its depressant action upon respiration and who prefer to use "Omnopon" to which less effect upon respiration is ascribed. The position must be viewed sanely and if the pain cannot be eased and if sleep cannot be induced, then morphine must be given in doses sufficient to achieve the desired results, certainly not less than 0.016 gramme (a quarter of a grain) hypodermically.

No half measures will relieve the pain of pleuro-pericarditis which if persistent could be severe enough to influence prognosis. The condition can usually be diagnosed by the ashen, anxious countenance which accompanies the localized and devastating pain. In addition to morphine in large doses the old fashioned leech applied to the precordium is most effective.

The problem of insomnia without pain remains. In these toxic cases, morphine is not recommended as it apparently has an exciting effect, whereas chloral hydrate in association with potassium bromide gives the more satisfactory result.

#### Cyanosis and Respiratory Distress.

Oxygen is still the standard therapeutic measure for cyanosis and respiratory distress though the method of administration has altered. Given through the medium of a tube and funnel, even though it is warmed, it is useless and distressing to many patients.

It has been stated that the inhalation of 40% to 60% oxygen raises the arterial saturation to near the normal amount in cases exhibiting arterial anoxemia. This degree of concentration may be obtained only by the use of the oxygen tent, a portable type of which has recently been placed on the market, whilst 30% may be reached when oxygen is given through the nasal catheter at the rate of two litres per minute. Although the nasal catheter uses in the ordinary way much less oxygen than is used in the open method, it becomes expensive at the rate suggested and the tent is decidedly costly in oxygen. However, alongside this must be placed the facts that under this high concentration of oxygen, the cyanosis diminishes or disappears with a slowing of the pulse rate and the respiratory rate and that the restlessness abates with an improvement in the general condition.

#### Cough.

The cough in pneumonia is not in itself a distressing symptom in more than a small percentage of cases. The distress lessens if the sputum be easy to expectorate, but if thick and tenacious it may cause a good deal of discomfort through the effort necessary to dislodge it. As a routine an expectorant mixture of some sort is given, but is not always necessary. If the sputum be tenacious and scanty, potassium iodide is prescribed by some, but ammonium chloride appears to be the most reliable and can be given in combination with the usual expectorants with a sedative such as codein or *tinctura camphora composita*.

In the later stages should the expectoration become profuse, ammonium carbonate and infusion of senega are recommended. The type of cough varies with the stage of the infection and the amount of sputum, and a knowledge of the sound of the cough may be very useful, especially when towards the end of the infection a short irritating cough develops of a type particularly its own, pleural in origin and giving warning of the onset of an empyema.

#### Abdominal Distension.

So much discomfort and embarrassment of respiration may occur as the result of abdominal distension that it calls for rapid attack at its onset. Special attention must be given to diet and all milk predigested by some of the usual methods. Constipation must be avoided, some preferring aperients and others a daily simple enema. Turpentine stipes are successful at times and pituitrin may be found necessary.

#### Stimulation.

Whisky, being less nauseous, is preferred by some to brandy which is still regarded as the best of the stimulants available. Alcohol in addition to its stimulating action tends to act as a hypnotic; but strychnine, despite a marked effect as a respiratory stimulant, has unfortunately a tendency to render the patient wakeful and restless. Cardiac stimulants, of which there have been several reported of late, have not been of notable value.

Here it may be useful to discuss the question of when to use stimulants. The writer gives alcohol at any time and in any case where the patient appears to need a little general assistance. Cardiac and respiratory stimulants are reserved for the indications that the strain is telling, a falling systolic blood pressure or pulse pressure with a rising pulse rate. However, even at this point it is a matter for discussion as to whether it is not more scientific to administer digitalis. Unfortunately small

doses of digitalis will not do what is required, raise the blood pressure whilst decreasing the heart rate; bigger doses are required and no agreement is universal as to whether it is better to give doses of 1.2 mil (twenty minims) three times a day to produce digitalization in six days or thereabouts or to digitalize the patient in mass doses in twenty-four hours. The answer in the writer's opinion is to use strychnine or pituitrin at first, but that if the heart rate continues to increase, the amount of digitalis that is required will depend upon the strength of the heart muscle and the stage of the infection at which the failure is occurring (in other words the amount of stress which the heart has withstood or has still to meet). If failure is occurring early in the fight, massive doses may be urgently required, but later 1.2 mil (twenty minim) doses may be sufficient. Here again, however, the treatment will depend upon the rapidity of the failure, and the state of the heart muscle prior to the onset of the pneumonia.

#### Termination of the Pneumonia.

So frequently does it happen that the crisis occurs during the patient's sleep without producing any disturbance at all, that the dangers attendant upon this sudden metabolic upheaval are minimized and neglected. Everyone will sooner or later meet a case in which this awaited event proves too much, and it behoves us to be ware and watchful. Many authorities use digitalis or strophanthus in small amounts, commencing twenty-four hours before the expected crisis. The wisdom of this is doubtful, but it may be wise to give 1.2 mil (twenty minim) doses in all cases in which the heart shows any enlargement or when the pyrexia has persisted for longer than seven days.

As the days go by, so increases the anxiety of the physician who welcomes the coincident fall of temperature, pulse and respiration or the uninterrupted lysis. Persistence of pyrexia has many causes calling for careful examination. It may mean simply a prolonged course of the disease, thirteen or fifteen day periods being no more than infrequent; it may mean the presence of a pleural effusion, especially if there has been evidence of pleural infection at the onset, delayed resolution or the commencement of a future lung abscess. Daily examination of the heart with especial emphasis on the position of the apex beat will give considerable assistance in the diagnosis. At this stage, when in doubt as to the possibility of the presence of fluid in the pleural space, it is wise always to explore the chest. The finding of pus will call for decisions not in the scope of this article, but even when no pus is found, needling may for some unexplained reason be the commencement of resolution.

#### Serum Treatment of Pneumonia.

Of the treatment of pneumonia by means of serum of univalent strength the writer has had no experience owing to the local difficulties of typing the pneumococcus. Polyvalent post-influenzal pneumococcal serum (Commonwealth Serum Laboratories product) has proved useful or apparently so in fifty to one hundred cubic centimetre doses, as cyanosis did not develop in the cases in which it was used.

This may be *post hoc* or *propter hoc*, as there are admittedly many such cases in which the toxæmia is so profound as to suggest a septicæmia from the onset and no methods of treatment are of avail.

#### Bronchoscopy.

When the pneumonia has developed as a secondary condition and offers any suggestion that it may be due to the plugging of a bronchus, bronchoscopy should be reverted to as early as possible. Even post-anæsthetic pneumonia may respond to an evacuation of the bronchus. It is not yet established as a method of treatment in unresolved pneumonia, but cases have yielded to this therapy. Other mechanical means such as collapse by artificial pneumothorax have been suggested, but in the writer's experience collapse does not necessarily follow the introduction of air into the pleural space, and the lung may be displaced towards the opposite side embarrassing the action of the sound lung. The method is not unattended by risk.

#### Delayed Resolution.

Treatment of delayed resolution must be directed towards building up the patient's resistance. Transference to the open air, with instructions to practise deep and forced breathing combined with additional diet and stimulants in the form of spirits of ether and ammonia usually proves sufficient.

#### Other Forms of Treatment.

Special forms of treatment, such as by "Salvochin" or potassium permanganate rectal injections combined with oral administration of thyroid gland extract, have proved successful, but not invariably so, and have thus not altered the general viewpoint of therapy. The scene changes rapidly, an hour or two entirely changing the picture, necessitating frequent attendance by the physician, especially in the later stages.

Hare has aptly remarked: "The physician must be the watchman all the time and the therapist only when treatment is actually needed." It is the individual who needs treatment, not the disease.

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## British Medical Association News.

### SCIENTIFIC.

A MEETING OF THE VICTORIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held at the Medical Society Hall, East Melbourne, on May 3, 1933, Dr. W. G. D. UPJOHN, the President, in the chair.

#### Contracted Pelvis.

DR. JOHN GREEN read a paper entitled: "Contracted Pelvis" (see page 299).

PROFESSOR MARSHALL ALLAN, in opening the discussion, referred in particular to diagnosis and details of management. Because it was difficult to estimate accurately the size of the fetus before delivery, erroneous conclusions were likely to be formed if any preconceived method of delivery was determined upon before the onset of labour with *primiparæ*. The pelvic measurements were a guide only, and those mentioned by Dr. Green might be compatible with the birth of an average sized child. When they were less, often the fetus was small and no disproportion resulted. As regards the relationship between the fetal head and the pelvic brim, it was necessary to remember that during pregnancy it was really a comparison of the head *plus* the thickness of the cervical tissues with the pelvic girdle. With the onset of labour this cervical tissue was often easily drawn up and the head readily engaged. Therefore no definite prediction was possible in border-line cases until the effect of labour had been observed. Another factor of great importance was the character of the uterine contractions, and many surprises occurred when these were adequate. He considered that all *primiparæ* should be allowed to go to term and to have a trial of labour because of the frequency of spontaneous delivery. While the main argument for induction of labour was the risk of postmaturity and subsequent disproportion, he still favoured awaiting the natural onset of labour. If induction were considered necessary, he favoured simple medicinal stimulation without the use of pituitary extract for those cases in which the head was still free. He was opposed to the induction of labour in such cases by rupture of the membranes. This method was not free of serious risks which might precipitate resource to abdominal section. When a trial labour was contemplated, the patient should be in a good hospital, because of the possibility of operative interference. Sedatives should be used freely, the bladder emptied at regular intervals, and an abdominal binder



applied. Abdominal palpation and rectal examination would give sufficient information of the progress of the case as long as the membranes were intact. A vaginal examination was essential after rupture of the membranes. As long as the cervix was progressively dilating and the head descending, the trial should continue with frequent observation of the fetal heart rate. Professor Allan considered that there was a tendency to assume too soon that the patient could not deliver herself. She should be given every chance, and before reverting to Caesarean section one should remember the unpleasant sequelae frequently associated with that operation. In addition, he referred to the mistake of assuming that, because a caput was visible at the vulva, the head was fully engaged. In many cases much of it was still above the brim, and the application of high forceps in such cases was a more dangerous procedure than Caesarean section. Induction of premature labour was very valuable for the *multipara* with a previous history of still-births. One should be careful to obtain a clear account of the previous delivery, as the fetal death was not always due to disproportion. Finally, he stressed the importance, wherever possible, in all doubtful cases of consultation with an experienced colleague.

DR. ARTHUR WILSON pointed out that in any labour there were several factors to be considered: (i) the size of the pelvis and the size of the child, (ii) the position of the child, (iii) the presentation, (iv) the time when the membranes ruptured, (v) the mouldability of the fetal skull, (vi) dilatability, (vii) the strength of the uterine contractions. In an unsuccessful labour any one or any combination of these factors might fail, and the important point was to assess the real difficulty. Many of the cases that went wrong might not be due to contracted pelvis at all, although that was usually the reason given when an explanation was demanded. It was important to remember that a woman's whole life might be altered by this hasty diagnosis.

The fetus might become obstructed at some point and then the question of when to interfere became very important. One might interfere at the right time and get a good result, or at the wrong time and get a bad result. He instanced this by a patient sent to him by two practitioners. By their united efforts with forceps these practitioners had been unable to deliver the woman. She delivered herself naturally after the quarter of a grain of morphine given her for transfer to hospital.

When a patient wished him to attend her, Dr. Wilson always liked to see her once early to investigate her general condition and the condition of the uterus. At this time he always took the external measurements. He frequently got readings of 9:10:7½. He considered the external conjugate the most important, and if this was less than seven and a half inches, except in very thin women, there was a great risk of trouble. At this time it was impossible to estimate by ordinary pelvic examinations the internal measurements, which were much more reliably made after seven months, when softening of the maternal parts had taken place. In the first three months the size of the pelvis was always under-estimated.

During the next few months Dr. Wilson's aim was to bring the patient to term in good condition. With a *primipara* he made a second examination in the thirty-fourth, thirty-fifth or thirty-sixth week. The head should now be engaging in the pelvis. If not, it was a warning of the possibility of trouble, and the patient had to be put where she could be attended to and, if necessary, operated on. At term, after a long experience, he left them alone to come into labour themselves, and would rather let them go over time. He was doubtful of induction in *primigravida*, and thought that medicinal forms might give rise to a dead baby from quinine. Occasionally he induced labour with a tube at or about full term, but he tended more and more to leave the patient alone.

In *multipara* Dr. Wilson was keen on induction for minor degrees of pelvic contraction, and his rule was that if the woman had had a difficult delivery as a *primipara*, but without a destructive operation, then induction one month early was practically always successful.

In attempting delivery in any border-line case there were two factors to be considered before interfering. Dr. Wilson set them out in the following way.

	1	2	3	4
A. Level of head...	Low	Low	High	High
B. Dilatation of cervix	Fully	Not fully	Fully	Not fully

With combination 1 there should be no difficulty; with 2 there would be trouble, but probably not much; with 3 there would be trouble, and in 4 there was certain to be trouble. He mentioned this to stress the point that they should treat the condition with their eyes open. A failed forceps operation should not be the first sign to the obstetrician that he had a difficult case to deliver. If there was doubt, they should give morphine and wait. They should always be willing to get efficient assistance. They should remember that an infinity of patience was the greatest necessity for an obstetrician.

DR. ELLIOT TRUE considered that in addition to contracted pelvis they had to add the factors of the character of the uterine contractions and the size of the baby. The modern term disproportion gave a much better idea of the conditions. The incidence of contracted pelvis, as given in the text books, was exceedingly variable, varying from 5% to 24%. Confining himself to the figures at the Women's Hospital, Melbourne, Dr. True said that during the past seven years there were 329 cases of contracted pelvis in 22,673 confinements, which worked out at about 1.45%, of which more than 50% terminated naturally. In terms of a general practice this meant that in 200 confinements there would be three cases of contracted pelvis. Of these patients one would have natural delivery, one would require forceps, and the third would need Caesarean section. Actually in practice eclampsia and chronic nephritis complicating pregnancy were one and a half times more frequent, and certainly produced greater maternal morbidity and fetal mortality.

There were three essential factors: (i) power or uterine activity, and there was no way of estimating this; (ii) passenger or size of baby, and only rough estimates were possible; (iii) passages, and here pelvimetry should be of help, but actually it was unreliable and misleading. The baby's head and the hand of the obstetrician were the best and most practical pelvimeters.

The important guides were: (i) the engagement of the head and (ii) the accessibility of the sacral promontory to the vaginal examining finger. In *primipara*, excluding those with obvious deformity and pelvic tumours, if the head was engaged in the last two weeks, there should not be the slightest worry. He had not seen any case of funnel pelvis, and did not expect trouble at the outlet, except with a narrow inlet. A vertex not engaged at term did not necessarily presage trouble. If the sacral promontory was not in easy reach, a reasonably sized baby would probably go through. Non-engagement was sometimes due to faulty flexion of the head. If the sacral promontory was easily reached and the head was not engaged in the last two weeks, interference might become necessary, but two out of three babies would be delivered through the natural passages.

For a *primipara* the treatment was a trial labour. The disadvantages of induction of labour outweighed the advantages in *primipara*.

In a *multipara* induction of labour with a tube before term was the treatment. The points that indicated the failure of a trial labour were: (i) non-descent of the head in the presence of good pain, except in posterior positions; (ii) edema of the cervix which was not being taken up. In these circumstances Caesarean section should be performed at once.

DR. W. IVON HAYES said that it was difficult to define contracted pelvis; the term was misleading and affected treatment. He would rather see it replaced by the term disproportion or even dystochia. As regards external pelvimetry, he thought it would be better to throw all pelvimeters away. The information obtained from them was often unreliable and misleading. First normal

measurements might lull suspicions. Dr. Hayes had seen a patient who had been in labour five days and the membranes had been ruptured for two days; the head was not fixed, and he thought that the head would not go through. The practitioner concerned objected that the external measurements were all right. Cesarean section produced a nine pound baby.

Secondly, the measurements might give rise to undue apprehension. He instanced a second case in which there had been small measurements, and the patient had suffered a good deal, and after the rupture of the membranes the practitioner had manually dilated the os and tried forceps. Dr. Hayes saw the patient during the first stage, when there was no apparent disproportion. He suggested giving morphine and four hours later, although he had waited at the hospital with the other practitioner, they were unable to reach the labour ward in time to deliver the child.

Dr. Hayes then quoted some figures which included three cases with small external conjugate measurements. Two of these patients were delivered naturally, one with low forceps and the other without interference; the third had been an elective Cesarean section. Some of these unfixed heads in *primiparae* were due to a posterior position, and an attempt should be made to rotate them. Dr. Hayes condemned induction of labour, unless it was medicinal, if it was to be followed by trial of labour. In attempting to estimate the possibility of the head engaging he had found Fowler's position a help.

Dr. S. CRAWCOUR suggested version as another form of treatment. He had seen a *multipara* in whom the head was not fixed and the cervix fully dilated. High forceps had failed. He did a quick version and delivered a living child. Later a bony boss was found on the pelvis. He had resorted to version on two other occasions with success.

Dr. EDWARD WHITE said he could not help thinking how rarely one met with contracted pelvis in private work, and yet in hospital practice it was not infrequent. He remembered how after the war there was an increase in the incidence of contracted pelvis at the Women's Hospital, almost wholly due to the influx of war brides, who had been brought up under much less favourable conditions than those obtaining in Australia. Dr. Green had brought out very well the interesting point that it was the disproportion that was the trouble. He would look on Dr. Green's point about the caliper measurement of the fundus as a good one in estimating the size of the baby. He had listened with great interest to remarks on pelvimetry; for many years he had used routine external measurements, but for internal measurements had relied on Nature's pelvimeter. He approved of the induction of labour in the woman who had had a still-born child as a *primipara*. He would put the patient in hospital and induce labour three weeks before time. He used to use gum-elastic bougies, but now used a rectal tube. Once having decided to induce labour, they should follow it up. He used small doses of pituitrin (four minims) six hours after introduction of the tube and repeated the dose if necessary. He thought Dr. Wilson had referred to a great truth when he spoke of the harm done to the patient and her husband by a hasty diagnosis of contracted pelvis.

Dr. B. MILNE SUTHERLAND said there were definite contracted pelvis which constituted a difficulty with a normal sized child; fortunately many of the patients had to pass only a small child. He agreed with Dr. Wilson that infinite patience was required.

The importance of ante-natal care had been stressed and they all had to admit this; but very frequently in giving treatment some men were destroying confidence instead of building it up. He was sure one of the main things was to have the patient going into labour thoroughly confident.

As regards the other factor, the size of the child, he would not think that he could estimate it as accurately as Dr. Green had suggested. The mouldability of the head could be arrived at only by a definite trial. The powers were very definitely influenced by confidence. Funnel pelvis were a very definite entity, but were fortunately rare. The points in their recognition were: (i) The carrying angle or angle of the pubic rami was

definitely reduced or more acute as measured by the fingers. (ii) The lower edge of the pubic ramus was sharp, with a tendency to turn in. (iii) The ischial spine pointed in towards the pelvic canal instead of being part of the insweep of the pelvis.

Dr. Sutherland was not sure of the value of pelvimetry, as different observers were apt to get different results. He thought digital examination gave the required information. He would like to point out that under present methods of teaching they were apt to send out students inefficiently trained, as they were taught not to do vaginal examinations and consequently never learnt thoroughly the feel of the interior of the vagina.

Cesarean section was less frequent than formerly, and he thought this was right, as they had to remember that there was always the possibility of sequele. He could remember two patients with intestinal obstruction caused by bands after Cesarean section.

Dr. R. H. FETHERSTON said one or two speakers had mentioned points upon which he held strong views. First, as to pelvic deformities, conditions had changed in recent years; formerly a large proportion of babies had been born and reared overseas, often having lived under bad conditions. Definitely deformed pelvis were then seen more often. Funnel-shaped pelvis were not so rare as a previous speaker had suggested. Dr. Fetherston had seen two cases of uterine rupture due to funnel-shaped pelvis. Induction of labour or termination of pregnancy in the early months was more often practised in cases of marked pelvic deformity.

In regard to pelvic measurements, Dr. Fetherston did not think they were doing justice to the patient, particularly if she were a *primipara*. If they did not make external measurements and also investigate the size of the pelvis early in pregnancy. If external measurements were poor and the patient hard to examine, a general anesthetic should be given.

In regard to version, Dr. Fetherston agreed with Dr. Crawcour that version was at times a good way out of a difficulty, particularly when circumstances were unfavourable. He quoted a case of his own to illustrate the point.

Dr. W. G. D. UPJOHN said that he, as a surgeon, had listened to the subject with great interest. He would like an opinion on the possibility of assessing damages in the case of a woman who had had an injury to her pelvis from crushing, as in a motor accident. He did not feel competent to give an opinion, and referred such cases to a gynecologist, but he had seen cases in which an unfavourable opinion as to the outcome of a future pregnancy had been given and substantial damages awarded. He had followed some of these patients up and, as far as he knew from his brief experience, not one of them had required any assistance for delivery.

Dr. Green, in reply, stated that he had purposely avoided detail in order to preserve perspective in his more or less academic presentation of the Women's Hospital cases. It was anticipated that matters of detail would be raised in the discussion. He agreed with Dr. True that the incidence of contracted pelvis was not high in general practice, but felt that a lead could be given as to which types of cases might give trouble and the probabilities as to the outcome. He agreed with Professor Marshall Allan as to the frequent spontaneous result in border-line cases. This outcome was also stressed in his book on obstetrics by Whitridge Williams, who, nevertheless, performed Cesarean section on two-thirds of his residual cases. The probability of spontaneous outcome was definitely increased by suitable induction, and in a series of cases from the East End Hospital, reported by W. H. F. Oxley in *The British Medical Journal* of November 1, 1930, there was only one Cesarean section in 10,000 cases. Dr. Green agreed with Dr. Wilson that the "head not engaging" was a danger signal, so dangerous in fact that, in a case with the head not fixed in a *primipara*, there was a 50% fetal mortality by vaginal delivery when the baby was larger than eight pounds in weight, and Cesarean delivery was common. Dr. Wilson, however, did not accept this as an indication for induction in *primiparae*, but rather paradoxically he employed induction for *multiparae* who might be expected to be more

efficient in the labour. The induction incidence in Oxley's series from the East End Hospital was only about 1%, but this frequency of induction apparently determined an extremely low Caesarean rate. Dr. Green agreed with Dr. White as to the great value of ante-natal anticipation and felt that the lecture defined the probabilities in the different groups of cases and suggested fairly precisely the limitations of the different types of management.

## Public Health.

### AEROPLANE TRAFFIC AND THE PROTECTION OF AUSTRALIA FROM DISEASE.

THE following is a report by Dr. J. H. L. Cumpston, Director-General of Health of the Commonwealth, to the Minister for Health of the Commonwealth upon the possibility of introduction of disease into Australia by aeroplane traffic and upon the measures of protection necessary and possible to prevent such introduction.

#### 1. General Considerations.

Every community has, throughout recorded history, feared the introduction of disease and has applied such measures of defence as the existing state of knowledge, or ignorance, indicated. Until the present century the tendency has always been for these measures to be irksome and to impose unnecessary restrictions upon international communications and commerce. Medical research has, step by step, provided an established basis for rational action, so that it is becoming now increasingly possible to apply measures of hygiene to land and sea traffic adequate to prevent the transport of disease without embarrassment to trade. These measures have been codified in an International Sanitary Convention (1926), deliberately framed as a result of long experience of land and sea traffic, and based upon the known conditions of transport of persons and goods by land and sea with due regard to the time factor as a primary consideration.

The adoption of air traffic between nations has involved the careful consideration of entirely new conditions, which vary for each country much more than the conditions of land or sea traffic. Australia owes its freedom from the great epidemic diseases of the older countries to her insular condition and geographical remoteness, which have meant absence of land traffic and a valuable delay of several days between the overseas infected port and the first Australian port. Air traffic will largely nullify this isolation, especially as to the time factor, and the degree to which it will entail new risks or increase existing risks must be examined in detail. The principal advantage which air traffic offers to international commerce is speed, and it is therefore necessary that all measures should be so devised that this advantage is not nullified.

#### 2. The Nature of the Air Traffic into Australia.

It may be assumed that for many years air traffic into the Commonwealth will consist of:

(a) Private flights of individuals for pleasure or some form of personal or commercial enterprise. Such flights have hitherto occurred under very varying circumstances, such as: (i) the first and later flights from Europe, entering Australia at Darwin; (ii) the flight from America, entering Australia at Brisbane; (iii) the flight from Noumea, entering Australia at Maryborough; (iv) flights from New Zealand, entering Australia at Sydney; (v) the flight from Europe, in which the aviator landed at an unauthorized spot on the north-western coast of Western Australia; (vi) the seaplane flights from Europe, entering Australia at Darwin and Broome.

(b) Regular commercial air services, such as the mail service now under consideration, which would most probably commence at a near point in Asia or the adjacent islands and enter Australia at an established settlement on the north coast—at present Darwin and Wyndham are the only places under consideration (*vide* report of the

Inter-Departmental Committee on Air Communications Within and Beyond Australia, October, 1932, F.3969).

Other similar air services are ultimately possible between Australia and Papua, New Guinea, Fiji, New Caledonia, and New Zealand, but these hardly require consideration at present.

#### 3. The Diseases Which Must be Considered.

Air traffic, under Australian conditions, differs from that in other countries in this important phase, that the service within Australia has to be carried on over sparsely populated country and through settlements with small populations having inadequate facilities and equipment for dealing with emergency occasions.

It is necessary, therefore, to take into consideration not only the infectious diseases, but all the other conditions of ill health; as, for proper quarantine protection, it is as necessary to determine that any departure from normal health is or is not a quarantinable disease as it is to take adequate precautions when any disease is definitely so diagnosed; and it is necessary to insure that sufficient provision is made at each place of call for the care of crew or passengers who become ill (see also paragraphs 10 and 11).

The infectious diseases which must be considered fall, as they do in the case of sea traffic, into two groups:

(a) The major quarantinable diseases—smallpox, cholera, plague, typhus, leprosy, yellow fever.

(b) The commoner infectious diseases, such as chicken-pox, measles, enteric fever, diphtheria, malaria, tuberculosis, dysentery.

#### 4. Action Necessary in the Case of the Commoner Infectious Diseases.

The commoner infectious diseases may, for present purposes, be divided into two groups—the mosquito-borne diseases and others. In the case of the latter group (diseases other than mosquito-borne), the action to be taken would be identical with that taken in the case of persons arriving by sea: the person attacked by such disease would be removed to hospital and there isolated until recovery. The first essential, however, is that the disease should be correctly diagnosed so that the possibility of a major quarantinable disease may be excluded. The incubation period of these diseases is longer or shorter, according to the disease, but as the proposed mail service would involve the arrival of aircraft at Darwin two days after leaving Sourabaya and three days after leaving Singapore (Departmental Committee Report, page 15), the quarantine officer at Darwin could not accept the shortness of the incubation period as a reason for excluding any of these diseases. Moreover, as it is proposed that mails should arrive in Sydney seven days after leaving Singapore, the possibility of any of these diseases developing at any stage of the journey between Darwin and Cootamundra must also be contemplated. This immediately brings into focus the conditions at such places as Katherine, Newcastle Waters, Camooweal, Cloncurry, Longreach, Charleville, Bourke, Dubbo, Cootamundra, and the places of call within Western Australia. At some of these places it is imperative that there should be, if the air service is providing a full passenger service, a medical practitioner of reliable ability and qualifications and some hospital facilities sufficient for the isolation of suspected cases. In paragraph 10 the relative importance of the various points of call in this relationship will be discussed.

The mosquito-borne diseases may for present purposes be limited to two, malaria and dengue fever.

Malaria is so prevalent throughout Asia that it is inevitable that from time to time some member of the aircraft crew or some passenger will arrive suffering from an acute malarial attack or with malaria in a latent stage. The person in an acute stage would probably be in such a condition that removal to hospital would be necessary. Persons with latent malaria are constantly arriving in Australia by sea, and over many years there has been no evidence that the introduction of such persons has resulted in the dissemination of the disease within Australia. This statement must, however, be qualified to the extent that in Northern Queensland and Northern Australia outbreaks



have occurred on new mining fields where mosquitoes of the right species were prevalent and where the conditions otherwise necessary for the spread of the disease have existed. In Northern Australia an ordinance makes possible the control of the movements of infected persons, but in other parts of the Commonwealth this is not possible.

Dengue fever is in a different class, as there is no known latent stage, and any person actually suffering from the disease is generally easily identifiable. It is therefore only necessary, so far as human carriers of the disease are concerned, to arrange for the isolation of the patient under mosquito-proof conditions in any district in which *Aedes aegyptus* mosquito is prevalent. In districts where this mosquito is unknown, treatment only is necessary, isolation not being required. The possible introduction of the disease by infected mosquitoes carried in the aircraft has to be considered, but this will be discussed in detail when yellow fever is being dealt with, as the same mosquito is the vector for both diseases (see paragraph 5, "Yellow Fever").

#### 5. Action Necessary in the Case of the Major Quarantinable Diseases.

##### *Leprosy.*

It may be regarded as extremely unlikely that any person suffering from leprosy will travel by air; in the twenty-four years during which the Commonwealth Quarantine Act has been in operation, only five persons suffering from leprosy have been detected on vessels arriving in Australia. These have been adequately dealt with under the Quarantine Act and the Immigration Act, generally by repatriation. There is no reason to anticipate any difficulty in dealing in the same way with any person so infected arriving by air. The possibility of such an event is, however, extremely remote.

##### *Typhus Fever.*

In the case of typhus fever also the probability of such an event is very small. If any person so infected were to arrive, the measures of isolation and delousing (if necessary) could and would be applied without difficulty in accordance with the instructions already existing under the Quarantine Act and without danger to the communities at the place at which the disease was discovered. As, however, true typhus fever does not exist in Malaya or the Dutch East Indies, the consideration of this possibility must be more academic than practical.

##### *Plague.*

Plague may reach Australia by sea either as plague in man, plague in rats, or plague in fleas. It is possible that a member of the aircraft crew or a passenger may arrive in Australia suffering from plague. Notwithstanding the great volume of sea traffic, plague in man on ships arriving in Australia has occurred only on four occasions, and on each occasion the infected person was a member of a coloured crew, himself an Asiatic. It is very unlikely that a member of an aircraft crew or a person who can afford the expense of travelling by air as a passenger will be so infected. Even if this unlikely event were to happen, the person so infected could not infect others, and the situation would be adequately met by isolation and treatment in hospital at the place at which the condition was first discovered.

Plague in rats and plague in fleas is, under present conditions of air commerce, so remote a possibility that it need hardly be discussed. Certain varieties of cargo are especially liable to foster the transmission of plague by ships. These cargoes are principally the commercial varieties of grain foods and the commercial foodstuffs.

It is clear, therefore, that under existing conditions the loading into aircraft of such merchandise as is so carried would be under such close observation that the accidental inclusion of infected rats with the cargo would be impossible. Even assuming the possibility, the efficient action taken by the public health authorities in Malaya and the Dutch East Indies has been so successful that plague has not existed for many years in any district in which any of the aerodromes is situated.

##### *Yellow Fever.*

Yellow fever does not exist in Asia now, and has never been known to exist anywhere on that continent. If it should spread to Asia, the possibility of its further spread to Australia would become a matter of immediate and grave concern to the Commonwealth Government. It is therefore wise and necessary to discuss here this possibility and the measures necessary if this possibility, at present remote, should become a reality.

The Advisory Council of the Eastern Bureau of the League of Nations, which met at Singapore on March 29, 1933 (at which meeting I was present as the representative of Australia), considered this subject at great length and in all detailed aspects. The conclusion which was reached concerning the possibility of the introduction of this disease into Asia and Australia was as follows:

The occurrence of yellow fever in Asia is dependent under present conditions upon its introduction from either America or Africa. Although yellow fever may be regarded as endemic over a wide area of West Africa, there is at present no evidence that the disease exists in any part of the eastern half of Africa. There are definite physical obstacles against its transfer to the eastern sector, but the development of air routes and the activity which is taking place in the opening up of new roads may serve to penetrate these natural barriers. Both forms of communication constitute a potential risk, the greater danger being probably from slow spread from village to village. Measures against spread by air routes have already been formulated. Surveys and re-surveys of the population along the new roads will show if the disease is spreading along them.

With the opening of the Panama Canal it was feared that yellow fever would be spread from America to Asia. Notwithstanding a very large amount of maritime traffic, no such spread has occurred. This is due for the most part to the measures which have been taken in the infected localities. The danger of spread from Africa is so much in the minds of the health authorities in that country that it is reasonable to assume that the precautions which will there be taken will be quite as effective as those taken in the infected areas in America. The Council considers that, while the position should be continuously and carefully watched, there is no immediate prospect of yellow fever entering Asia or Australia, and it considers further that each development in the direction of increasing risk will be met by adequate precautions introduced by each infected country in the terms of the International Sanitary Convention for Aerial Navigation. (Minutes of the Seventh Session of the Advisory Council of the Eastern Bureau, Singapore.)

In the light of this carefully considered opinion it may be assumed that the need for restrictive measures is not urgent, but it may nevertheless still be considered appropriate to consider some aspects of the situation in advance.

If yellow fever is to be introduced into Asia or Australia, such introduction will be by means of either infected mosquitoes or infected persons, especially persons in the incubation stage. In order that all possibilities of international infection might be thoroughly examined, the League of Nations Health Organization convened in November, 1932, an International Conference of Representatives of the Health Services of certain African Territories and British India. This conference was held at Cape Town and reached the following important conclusions:

The particular insect vectors by which yellow fever is carried from man to man occur almost universally throughout Africa, and these mosquitoes, though themselves habitually keeping within or close to the dwelling and having (by comparison with the anopheles vectors of malaria) a very short range of dispersal, are nevertheless capable of being carried considerable distances by rail, motor car or air, and, in the latter case, could be carried very rapidly for very long distances. Their danger to the distant susceptible community, if they should happen previously to have been infected in the yellow fever area, must

therefore be taken into account. Seeing that the ridding of aircraft from mosquitoes is quite practicable, this danger has only to be appreciated to be removed. Human infection, however, is more troublesome. Fortunately, the infective healthy human carrier, so formidable an obstacle to the control of many other epidemic diseases, has not to be considered in yellow fever; the danger from human transport is essentially limited to the person actually suffering or about to suffer from an attack of the disease, and who, in point of infective ability, only needs to be controlled during a few days of his incubation period before the illness arises and for the first three days after his illness has begun. But within these limits the risk of the rapid transport of such a person to an unaffected region, there to infect the mosquito vectors, is obviously facilitated by aviation and must be guarded against.

The International Sanitary Convention for Aerial Navigation, 1932, which will shortly be opened for signature at The Hague, requires that in infected areas certain specified precautions should be observed in the selection of aerodromes for the purpose of international flight, in their equipment when selected, and in their administration.

After giving careful consideration to the yellow fever chapter of the convention, as well as to its other provisions, the conference is convinced that the immediate acceptance of the principles therein formulated will not only form an invaluable safeguard against the spread of yellow fever to other countries when air trunk routes are established, but is needed in advance of their establishment, so that the conditions required for security will be known when these routes are being planned.

Experiments demonstrating that *Aedes* mosquitoes can travel long distances by aeroplanes were cited, but it was agreed that the risk of transporting mosquitoes in an infective condition is comparatively small and can be met by the simple measure of de-insectization of aeroplanes. *Aedes* may travel by trains or motors with equal facility. The transportation of persons during the incubation period of the disease appears to constitute a greater danger than the carrying of infected mosquitoes.

At this stage in the development of international air traffic, as far as Australia is concerned, it is only necessary to consider aircraft arriving from Malaya and Dutch East Indies. The aerodromes at Singapore, Batavia, and Soerabaya have been inspected by myself, and it is quite definite that:

- (a) These aerodromes are so situated that the number of mosquitoes likely to seek entrance into an air vessel is small.
- (b) There is no malaria in the vicinity of these aerodromes.
- (c) The facilities at the aerodromes and the construction of existing aircraft are such that the aircraft could, without any difficulty, be freed from mosquitoes before departure.

Mention should be made here of the new aerodrome for civil aviation under construction at Singapore. This is an extensive area of 240 acres situated some three miles from the centre of the town, with excellent road communication. This aerodrome is being formed by the extensive reclamation of swampy land with spoil brought from a hill some miles distant. When completed this will be a modern aerodrome, and I was assured by the local authorities that their intention was to construct and equip this aerodrome so that it would comply in all respects with the provisions of the Sanitary Air Convention. Certainly it will be, so far as the aerodrome area itself is concerned, quite mosquito-free, all breeding places having been eliminated.

The conditions at the aerodromes at Batavia and Soerabaya may be accepted as satisfactory. I did not visit Dilli, so cannot comment upon the conditions at the aerodrome at that place, but, as will presently be seen, the

measures actually now necessary can be applied without difficulty at that airport.

The Cape Town conference quite definitely expressed the verdict that the principal danger so far as yellow fever was concerned was "the transportation of persons during the incubation period of the disease" and that "the risk of transporting mosquitoes in an infective condition is comparatively small and can be met by the simple measure of de-insectization of aeroplanes".

It might be well to recall the extent of the risk of transporting mosquitoes, whether these mosquitoes are infective or not. The most comprehensive investigation actually made on this subject was made by Griffiths and Griffiths at Miami, Florida, in 1931. The results of this investigation may be summarized thus: They drew the conclusions that "with conditions at airports such as would permit of many mosquitoes getting aboard, it might be expected that approximately one-fifth of the original number would be transported for a long distance—at least 1,250 miles—in one day, with repeated landings and opening of doors, hatches and windows, and refuelling, unloading and loading taking place". They were of the opinion that there is no obstacle to the efficient treatment of aeroplanes so as to destroy mosquitoes.

From the administrative aspect, therefore, we are faced with the question whether, as yellow fever does not exist in Asia, it would be competent or advisable for the Commonwealth to impose any measure at all on air traffic from Asia to Australia. First has to be recalled the possibility of the introduction of malaria and dengue fever—the latter carried by the same mosquito species as that which carries yellow fever. Then has to be recalled the advice of the Cape Town conference, that:

Immediate acceptance of the principles of the Sanitary Convention for Aerial Navigation will not only form an invaluable safeguard against the spread of yellow fever to other countries when air trunk routes are established, but is needed in advance of their establishment, so that the conditions required for security will be known when these routes are being planned.

While no regular air service exists as yet between countries known to be infected with yellow fever and countries believed not to be infected, there is every reason to be prepared for such services being planned and put into operation.

The conditions at the aerodromes of departure are under present conditions satisfactory. The further opinion was formed that even if yellow fever were to be introduced into Singapore or Java, there would be little practical difficulty in insuring safety of air traffic from the aerodromes at these places. The conditions at Dilli, in this event, would require further investigation.

It is, however, considered advisable that from the commencement of regular air traffic the practice should be instituted of treating each aeroplane immediately before departure so as to free it from mosquitoes. By the use of volatile substances, lethal to mosquitoes, of which several are known, this process is simple and rapidly performed. This practice will have the additional advantage of covering the risk, admittedly remote, of the transport of mosquitoes infected with malaria or yellow fever. It is appropriate at this stage to recall the findings of the Yellow Fever Commission of the Office International d'Hygiene Publique (report, October, 1932), in respect of two important aspects of the risk of international transmission of yellow fever:

A good deal has been written lately about the wide "range of dispersal" and power of flight of the yellow fever mosquito, as estimated by field experiments under artificial conditions, but for the purposes of practical sanitation it is more important to know that yellow fever has never been conveyed by mosquitoes many yards from an infected house. The late Senior Surgeon H. R. Carter, whose epidemiological experience of yellow fever was unrivalled, wrote on this point: "I think it is fair to say that yellow fever will rarely be conveyed by mosquitoes 100 yards. Surgeon White would put the limit far below this, but I believe that it is quite frequently conveyed by

mosquitoes across the street or to a house at the back of the infected house. There are two cases, one reported by Moller, the other by myself, in which it seems to have been conveyed much farther: in the first 225 metres, in the second 152 yards. Possibly we were both mistaken, and there were some other means of infection than those we accused. Seventy-five yards would be about as far as one would expect it to be conveyed." Occasionally to recall in this manner the views of sanitarians who were actually engaged in dealing successfully with serious epidemics is a useful corrective to the modern tendency to require that measures for prevention and control should be devised to cover all possible risks indicated by recent laboratory results.

In view of the ease with which aerodromes can be kept free from yellow fever mosquitoes by measures not involving drainage or clearing of streams, swamps and ditches, as well as the rapidity with which aircraft can be cleared of these insects by spraying or other simple means, the practical risk of conveying infection by aerial navigation is concerned almost solely with the human case in the incubation period of the disease. Article 42 of the Sanitary Convention for Aerial Navigation prescribes effective measures against this risk. Moreover, if it should be found that personnel and intending passengers can be effectively immunized against the disease, the fears of countries menaced by yellow fever will be greatly allayed and it will be practicable to dispense with some of the provisions of the convention which at present may, on occasion, interfere seriously with speedy travel.

From the above considerations, therefore, while Asia remains free from yellow fever, the following measures will be sufficient for the protection of Australia from yellow fever, and will offer material safeguards against the introduction of malaria and dengue fever. In this connexion it should also be remembered that soon after leaving Katherine aircraft enter a geographical zone in which the mosquitoes necessary for the transmission of these three diseases do not exist, and the aircraft continue in this zone until their arrival at the final destination—Cootamundra. The measures indicated are: (a) Medical inspection of passengers and crew of the aircraft before leaving each overseas aerodrome; (b) measures at each overseas aerodrome for removing all mosquitoes from the air craft; (c) medical inspection of passengers and crew of the aircraft on arrival at the first Australian point of entry.

If it should happen that Asia should become infected with yellow fever, more extensive measures would be required, as prescribed in Chapter II, Section II of the International Sanitary Convention for Aerial Navigation, 1932; but in the meantime it is possible that increased knowledge of the protective power of immunization may remove the necessity for some of these measures.

Under existing conditions the measures now indicated are in accord with those prescribed in Chapter II, Section III of the Convention, which prescribes the

Provisions in respect of territories or regions in which yellow fever does not exist, but in which there are conditions which permit of its development.

The principal provisions prescribed are:

Article 47. In territories or regions where yellow fever does not exist, but where there are conditions which permit of its development, the measures which may be taken on the arrival of an aircraft at a sanitary aerodrome are the following:

(1) Inspection of aircraft and cargo to insure that they do not contain mosquitoes, and, if necessary, disinsection.

(2) Medical examination of passengers and crew to ascertain that they are free from symptoms of yellow fever.

It will be noted that the above applies only to measures "on arrival", but in as much as medical inspection before departure is prescribed for smallpox, cholera *et cetera*, and will therefore be made in any case, the only other measure is "disinsection", that is, ridding the aircraft

of mosquitoes. The value of this measure is much greater when it is applied before the journey commences than it would be when applied on arrival at the overseas destination; therefore it is proposed to require it in the case of every aircraft leaving Asia for Australia.

It might be contended that by ridding aircraft of mosquitoes at the last overseas aerodrome Australia would be sufficiently protected, but this would not remove the risk of crew and passengers being infected actually in transit between overseas aerodromes.

#### Smallpox.

Smallpox is known in Malaya, although it is now rare in the neighbourhood of Singapore; it does not now exist in Java.

Of all diseases smallpox is that disease which has provided for Australia the greatest "quarantine risk". The safeguard which Australia has always possessed is the length of the voyage from Asia, providing sufficient time for the development of the disease before the passenger arrives in Australia. It has been proven throughout a century of recorded Australian quarantine history that, with the exception of a very few instances, this delay in transit has permitted the discovery by the ship's doctor or the quarantine staff of all cases of smallpox which, if not detected, might have been responsible for starting an epidemic within Australia. Whenever transmission of the disease has occurred within Australia, it has been initiated by sufferers undetected on arrival or developing their first symptoms after having arrived in Australia apparently well.

Air traffic completely alters these conditions and, as we have in vaccination a means for removing this risk altogether, it would be unwise if this measure of protection were not fully used.

The provisions of the International Sanitary Convention for Aerial Navigation relating to smallpox are:

Article 35. (A) If there has not been a case of smallpox on board, the only measures which may be prescribed are in the case of persons who have left within fourteen days a "local area" where smallpox is epidemic and who, in the opinion of the sanitary authority, are not sufficiently immunized. Such persons may be subjected, without prejudice to the terms of Article 52, to vaccination, or to surveillance, or to vaccination followed by surveillance, the period of which shall not exceed fourteen days from the date of arrival of the aircraft.

(B) The following measures are applicable if there is a case of smallpox on board:

(1) Medical inspection.

(2) The sick shall be immediately disembarked and isolated.

(3) Other persons whom there is reason to believe have been exposed to infection and who, in the opinion of the sanitary authority, are not sufficiently immunized may be subjected to the measures prescribed in paragraph (A) of this Article.

(4) Soiled linen, personal effects, and other articles which the sanitary authority considers to have been recently contaminated, shall be disinfected.

(5) The parts of the aircraft which have been occupied by persons ill with smallpox and which the sanitary authority regards as contaminated shall be disinfected.

For the purposes of this Article persons shall be considered immune (a) if they can produce proof of a previous attack of smallpox, or if they have been vaccinated within less than three years and more than twelve days, or (b) if they show local signs of early reaction attesting an adequate immunity. Apart from cases where these signs are present, proof will be afforded by a written certificate of a doctor, authenticated in the manner prescribed in the second paragraph of Article 32.

The method of authentication prescribed in Article 32 is as follows:



Proof will be afforded by a written declaration signed by a doctor whose signature shall be officially legalized; or, failing such legalisation, the declaration shall be countersigned by either (a) the medical officer appointed to a sanitary aerodrome, or (b) a person, other than the person performing the inoculation, who is authorized to witness a passport application under the regulations of the country.

This method of authentication has not been deemed sufficient, and in advising the Government of the United Kingdom of its official attitude in respect of becoming a party to this convention and asking that Government to inform signatory countries, the Commonwealth Government has made reservations as regards Articles 32 and 35 to the effect that the Commonwealth will accept only those certificates which are signed by a permanent official of the public health service of the country concerned and which carry within the text of the certificate an intimation of the office occupied by the person signing the certificate.

It is proposed, therefore, to require, in the case of air traffic, that:

(a) The crew and passengers of aircraft shall: (i) be medically inspected at each aerodrome before departure; (ii) be vaccinated against smallpox within fourteen days prior to departure or sufficiently immunized against smallpox and produce a valid certificate signed by a responsible official of the health department of the country of departure attesting the fact of immunity or the fact of vaccination within fourteen days prior to departure; (iii) be medically inspected on arrival at the point of entry into Australia, and, if evidence as required by the last preceding subparagraph be not available, be vaccinated. Full particulars, including address at destination, shall be given on arrival in respect of every person on board.

(b) All measures as prescribed by the convention shall be carried out if any person on board the aircraft is discovered to be suffering from smallpox.

It is not proposed under ordinary conditions to subject the passengers to surveillance.

#### Cholera.

Throughout the whole century of recorded Australian quarantine history cholera has not, although doubtless introduced, occurred amongst the land population. It has not, in fact, occurred at all frequently on vessels coming to Australia, and during the last seventy years it has, so far as is known, occurred only once on a vessel coming to Australia. Moreover, Singapore and Java are now quite free from cholera.

It is not, therefore, proposed to resort to inoculation as a measure of prevention, but it will be necessary to require medical inspection before departure and on arrival to detect the incubating case. The convention permits of surveillance of passengers and crew for a period not exceeding five days from the date on which the aircraft left the infected local area (Article 30). But it is not proposed under existing conditions to require this surveillance; the history of maritime traffic does not suggest the necessity for it. In this connexion it is well to recall that the immigration laws, by preventing the transport of large bodies of Asiatic deck passengers, introduce a safeguard which is not available to other countries.

#### 6. Administrative Aspects of the Measures Indicated in the Last Paragraph.

The convention expressly provides for action in the case of infectious diseases generally, as well as in the case of the specified major quarantinable diseases. The relative provisions of the convention are:

Article 13. The competent authority of any aerodrome may, on the advice of the medical officer attached to the aerodrome, prohibit the embarkation of persons with symptoms of infectious disease, except in the case of the transport of sick persons by aircraft specially allocated for the purpose.

In the absence of a medical officer the competent authority of the aerodrome may defer the departure of such persons until the advice of a doctor has been obtained with regard to them.

Article 14. If there is on board an aircraft a case of infectious disease, duly verified by the aerodrome medical officer, which is not specified in Part III of this convention, the usual measures in force in the country in which the aerodrome is situated shall be applied. The sick person may be landed and, if the competent sanitary authority considers it desirable, isolated in a suitable place; the other passengers and the crew will have the right to continue the voyage after medical inspection, and, if necessary, the carrying out of the appropriate sanitary measures.

Such of these sanitary measures as can be carried out at the aerodrome should be so arranged in relation to the administrative and customs operations that the aircraft may be detained as short a time as possible.

It will be seen therefore from the above that all of the measures required under the Commonwealth Quarantine Act are:

(1) Medical inspection of passengers and crew of aircraft at each aerodrome before departure.

(2) Vaccination (or proof of immunity) against smallpox in respect of each member of the crew or passengers.

(3) The treatment of the aircraft at each overseas aerodrome (and, if necessary, at the point of entry into Australia) to destroy all contained mosquitoes.

(4) Appropriate action in the event of any person arriving in the aircraft being found to be infected with any of the infectious diseases in question.

These measures involve:

(a) The use of the powers contained in the Quarantine Act to prescribe and enforce these measures.

(b) Goodwill and mutual understanding as between the health authorities of the Commonwealth and of the overseas countries concerned.

(c) Definition of the aerodromes within Australia which will be legal points of entry into the Commonwealth for aircraft.

(d) Adequate staff and equipment, not only at the points of entry into Australia, but also at points of landing within Australia up to the final aerodrome, and adequate control at each of these points to insure that all legal formalities shall be deliberately, quickly and efficiently discharged.

(e) The provisions of the Immigration Act in respect of conditions of disease and disability must be administratively covered.

These will be discussed in the succeeding paragraphs.

#### 7. The Legal and Administrative Application of the Measures Prescribed.

By Section 15A of the Quarantine Act it is provided:

15A. (1) The master of any vessel bound for any port or place in Australia, which comes from or calls or touches at any proclaimed place, shall, while his vessel is at that proclaimed place and during the voyage to Australia, take, in respect of the vessel, her crew, passengers and cargo, all precautionary measures to prevent the introduction into or spread within Australia of any quarantinable disease which are prescribed by the regulations to be taken in respect of the proclaimed place.

(2) The master of any vessel who, having failed to comply with the preceding sub-section, suffers his vessel to enter any port or place in Australia, shall be guilty of an offence.

Penalty: One hundred pounds.

(3) In any prosecution under this section, if the master of the vessel satisfies the court that he was not aware of the precautionary measures required to be taken by him, and that he took all reasonable means to ascertain whether any such measures were necessary on his part, he shall not be liable to any penalty.

(4) Where a vessel has arrived from a proclaimed place and the prescribed precautionary measures have not been taken, any prescribed measures for the prevention of the introduction or spread of any quaran-

tinable disease may be carried out by a quarantine officer with respect to the vessel, her crew, passengers and cargo at the expense of the owner of the vessel.

By Section 5 of the *Quarantine Act* it is provided that "vessel" means "any ship, boat or other description of vessel or vehicle used in navigation by sea or air".

A regulation is therefore necessary prescribing that the person in control of every aircraft arriving in Australia shall produce a certificate from each overseas point of landing signed by an accredited medical officer of the health department of the country of departure, stating that "the crew and passengers of the aircraft did not show symptoms of any infectious disease at the time of departure".

The Health Department of the Netherlands-Indies uses a booklet, and this method, suitably modified, could well be used in Australia.

It will be necessary also to prescribe by regulation the form of certificate each member of the crew and each passenger shall carry, attesting recent successful vaccination or proven immunity against smallpox, and declaring the fact of disinsection immediately before departure. The *Quarantine Act* at present contains provisions controlling contact with aircraft arriving in Australia until the medical inspection on arrival has been completed.

It will be necessary also to prescribe that no aircraft shall leave Australia without such medical inspection on departure and without such certificates as may from time to time be prescribed. This involves also proclaiming "aerodromes" places of departure.

In making these provisions it will be safe to adopt for aircraft the same procedure as has long been adopted for maritime vessels and, so long as those countries remain free from disease, to exempt from medical inspection on arrival aircraft from New Zealand and the Pacific islands.

#### 8. Goodwill Between Countries Concerned.

Experience shows that the fullest measure of goodwill may be expected from all countries with which Australia is likely to have air communications; all that is necessary is that those countries shall have a clear understanding of the requirements of the Commonwealth. As these requirements are simple, the establishment of such an understanding should present no difficulty. The position has been made easy by my personal contact with the officials concerned in the two countries more especially involved—Malaya and Netherlands-Indies.

#### 9. Definition of Aerodromes Within Australia as Points of Entry for Aircraft into Australia and as Points of Departure from the Commonwealth.

It is necessary that a definite stand be taken up immediately on this point. Aircraft have hitherto made entry into the Commonwealth at various points. The time has now arrived when this should be more definitely controlled. The Air Convention prescribes the qualifications necessary before an aerodrome can be officially recognized as a "sanitary aerodrome" (see paragraph 10).

A proclamation will be necessary defining points of entry into the Commonwealth, and for proper legal control of the position it will be necessary at each place to proclaim landing points for both land-planes and seaplanes. This applies also to aircraft leaving Australia, as these will be as much subject to the terms of the convention as are those entering Australia.

#### 10. Staff, Equipment and Measures at Points of Entry into the Commonwealth.

The Sanitary Convention for Aerial Navigation provides:

Article 3. Each High Contracting Party undertakes to provide on its authorized aerodromes a sanitary organization for the current needs of prophylaxis, which, as a minimum, shall consist of definite arrangements to insure the attendance of a medical practitioner, at such times as may be necessary, for the medical examinations envisaged by this Convention.

Article 4. It rests with each High Contracting Party, taking into account the risks of infectious disease to which his territory may be exposed, to decide whether

or not to establish sanitary aerodromes and which authorized aerodromes will be selected for this purpose.

Article 5. The sanitary aerodrome should at all times have at its disposal:

(a) An organized medical service with one medical officer at least and one or more sanitary inspectors, it being understood that this personnel will not necessarily be in permanent attendance at the aerodrome.

(b) A place for medical inspection.

(c) Equipment for taking and dispatching suspected material for examination in a laboratory, if such examination cannot be made on the spot.

(d) Means by which to be able, in case of necessity, to isolate, transport and care for the sick, to isolate contacts separately from the sick and to carry out any other prophylactic measure in places suitable for the purpose within the aerodrome or in proximity to it.

(e) Apparatus necessary to undertake, if circumstances require, disinfection, disinsection and deratization, and, in addition, any other measures laid down in this Convention.

The aerodrome shall be provided with a sufficient supply of wholesome drinking water, and with a proper and safe system for the removal of excreta and refuse, and for the disposal of liquid waste.

It shall be maintained, as far as possible, free from rats.

Article 6. The medical officer of the aerodrome shall be an official of, or approved by, the competent sanitary authority.

Article 8. A sanitary aerodrome, in order that it may be designated a local area (circonscription) for the purpose of notification of infectious disease and for other purposes of this Convention must be so organized that:

(1) The entry and exit of any person is under the supervision and control of the competent authority.

(2) In the case of a disease specified in Article 18 of this Convention occurring in the neighbourhood, access to the aerodrome by any route other than the air is forbidden to persons suspected to have been infected, and measures are applied to the satisfaction of the competent authority with a view to preventing persons who are resident in or passing through the aerodrome being exposed to the risk of infection, either by contact with persons outside or by any other means.

In order that an authorized aerodrome which is not also a sanitary aerodrome may likewise be designated a local area, it is necessary in addition that it shall be so situated topographically as to be beyond all probable risk of infection from without.

The High Contracting Parties will notify to the Office International d'Hygiene Publique aerodromes which constitute local areas in accordance with the terms of this article, and the Office International d'Hygiene Publique will communicate the notification to the other High Contracting Parties and to the International Commission for Air Navigation.

#### 11. Measures at Places on the Routes Within the Commonwealth.

Two routes—eastern to Cootamundra and western to Perth—have to be considered. Both can be discussed under the same conditions.

For every commercial flight—and exactly the same applies to private flights—the precautions already indicated cover much of the risk, but they do not cover one great danger, the person arriving while in the incubation stage of the disease. At any point after arrival in Australia a member of the crew or a passenger may show signs of malaria, dengue fever, cholera, smallpox, or other infectious disease. For his own sake and for the sake of the community, action must be taken to place him in hospital as soon as the symptoms appear, and, especially, action must be taken to secure reliable diagnosis at the earliest possible moment.

The western route is already adequately provided with a quarantine organization operating in respect of all maritime traffic, and no further arrangements are necessary. At Wyndham, Derby, Broome, Port Hedland, Onslow, Carnarvon and Geraldton, quarantine officers are appointed and are carrying on routine quarantine duties. It is only necessary to furnish these officers with appropriate instructions.

Along the eastern route it will be necessary to make provision. The principal points on this route are Newcastle Waters, Camowear, Cloncurry, Winton, Longreach, Charleville, Bourke, Dubbo and Cootamundra.

The same control as is necessary at Darwin will also be necessary at these aerodromes within Australia, so that all formalities can be properly discharged without surging public interference.

It is, however, appropriate to consider the relative importance of these various points of call.

The schedule prescribed in the departmental committee's report indicates that overnight stops will be made at Birdum, Mount Isa, Charleville. Possibly this schedule will be changed, but it is clear that the necessary internal organization, so far as the needs of this department are concerned, will have to be provided at three places at the most.

#### 12. The Application of the Provisions of the Immigration Act.

There should be no difficulty in applying to air traffic the same procedure as is now applied to sea traffic, so far as the control of all medical aspects of the *Immigration Act* is concerned. Passengers will be examined and reported to the Collector of Customs if they fall within the provisions of the Act as at present. It is probable, however, that the text of the *Immigration Act* or regulations thereunder will require some revision if they are to be applied to air traffic.

#### 13. Animal and Plant Quarantine.

The control of the importation of plants by air traffic will be carried out, as hitherto, by customs officers reporting to the quarantine officer plants or plant goods which call for action under the *Quarantine Act*.

The importation of animals by air route is, under all ordinary circumstances, unnecessary, and therefore it is proposed to prohibit the importation of all animals by aircraft, except with the consent of the Minister previously obtained.

### University Intelligence.

#### JUBILEE OF THE SYDNEY MEDICAL SCHOOL.

THE ceremony of commemorating the jubilee of the Medical School of the University of Sydney will take place in the Great Hall of the University at 8.30 p.m. on Friday, September 29, 1933.

The official opening of the new medical building will take place at 2.30 p.m. on Thursday, September 28, and will be followed by a *conversazione*. During the afternoon the ceremony of unveiling a memorial plaque to the late Robert Gordon Craig will take place.

The Senate of the University desires that all graduates of the Medical School and all those who have been at any time connected with the Medical School, should have the opportunity of being present on these historic occasions.

It is the intention of the Jubilee Committee to hold an exhibition of interesting relics, mementoes, photographs *et cetera*, which illustrate the history of the Medical School. Any graduates who have material, such as photographs of former students or teachers, or of graduates who have lost their lives on active service *et cetera*, are asked to communicate as soon as possible with the Honorary Secretary, Jubilee Committee, Medical School, University of Sydney, Sydney.

As it is necessary that the Committee should obtain an idea of the number of those who intend to be present, it has been decided that official invitations will be sent to all who notify the Honorary Secretary of the Committee before Friday, September 8, of their intention to be present.

### Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phoenix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Brisbane Associated Friendly Societies' Medical Institute. Chillagoe Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL are advised, in their own interests, to submit a copy of their agreement to the Council before signing. Lower Burdekin District Hospital, Ayr.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	Combined Friendly Societies, Clarendon and Kangarilla districts. All Lodge Appointments in South Australia. All Contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 85, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.
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